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COMPUTERWORLD

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Wages Rise an Average 7.5%

Salary Hikes Stick to Carter Limit

By Brad Schultz
CW Staff

LAKE BLUFF, Ill. — DP salary increases in the U.S. generally held close to President Carter's antiinflation guidelines through the year ending last June, according to a recently released nationwide survey.

DP salaries rose an average of 7.5% in that period, barely exceeding the Carter Administration's 7% constraint, according to the 15th annual "Weber Survey on Data Processing Positions" from A.S. Hansen, Inc. The Hansen estimate nearly fits the 7.3% average hike in salaries Robert Half, Inc. predicted early this year [CW, Feb. 12].

Late last year, President Carter sent shockwaves through some quarters of the computing community with his announcement that annual salary increases be limited to 7% [CW, Oct. 30, 1978]. At the time, a few categories of DP professionals were accustomed to annual income hikes of twice that rate.

Vendors and user organizations feared losing their most prized employees since the Carter plan did not prohibit an individual from jumping to another firm for much higher pay [CW, Nov. 6, 1978]. Carter called the plan voluntary, but threatened noncompliant firms with loss of federal contracts.

In terms of "families" of DP job slots, Hansen found a 7.12% rise in strictly management stipends. Five job families met the Carter constraint: applications programmers earned 6.33% more than they did last year; workers in DP operations had a 6.26% increase; salaries for computer operations workers were up 6.23%; telecommunications salaries increased 6.98%; and documentation professionals earned 4.17% more.

Several 'Violators'

But Hansen found other DP job types violating the Carter guidelines — none more so than data base management, with an 11.72% average boost in salaries between mid-1978 and mid-1979.

At 8.33%, data entry workers enjoyed the second fastest growth in income. Salaries in the systems and programming family increased an average of 8.23%.

Other DP job families violating the 7% lid were software programming at 8.18%; DP auditing at 8.03%; data control at 7.36%; and systems analysis

(Continued on Page 6)

CW Looks at DP Training

Training Budgets 'Incredibly Low'

By Don Leavitt
CW Staff

BETHESDA, Md. — Although users spent a bit more for DP training this year, training budgets remained "an incredibly low" 1.4% of the average installation's total DP budget, according to survey results just released by Brandon Systems Institute, Inc. (BSI).

Managers are the most undertrained people in DP "except for operators and keypunch people," a spokesman commented. And application programmers, too, have experienced a significant drop in their training since last year, according to the survey.

The drop in training days received by systems analysts and designers is "alarming" as well, the spokesman continued. People in this particular group had only eight days of training in 1979, compared with 10.7 day/person reported in the earlier study.

(Continued on Page 8)

AT&T Takes New Tack on Image

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — AT&T's front office apparently has decided that the best way of getting the right language incorporated into the new communications act now being drafted in Congress is by relating the present structure of the telephone industry to some pressing national problems, like the energy crisis.

The latest evidence of this strategy is a speech given here late last month by Ian Ross, president of Bell Telephone Laboratories, at the National Telecommunications Conference, an annual event sponsored by the Institute of Electrical and Electronics Engineers.

Ross began by saying that the national telephone network is evolving into the world's largest computer system. Besides improving existing facilities and services, it will provide some totally new ones — such as intelligent telephones equipped with visual displays that enable a subscriber to decide whether he wants to accept an incoming call (the display will show the caller's phone number). These phones may also use a distinctive ring to identify priority calls, Ross said.

Lightwave Revolution

On a related front, Ross noted that lightwave communications research has shown that photons can perform "many if not all of the functions" for which electrons are presently employed.

This technological revolution will change the ways many people work, shop, learn, vote and are entertained, Ross added, citing some examples — like an increased ability to work at home — to show these changes will be desirable.

He also reminded his audience that "at a time when there is growing concern about other segments of U.S. industry, the telecommunications business is innovative and profitable. It

(Continued on Page 6)

Second Close Call in a Month

Passenger Jets Nearly Collide Over Texas

By Marguerite Zientara
CW Staff

EULESS, Texas — Two American Airlines jets carrying a total of 230 people came within 600 feet of each other over Texarkana recently after the computer at the Air Route Traffic Control Center (ARTCC) here failed twice within six minutes.

The incident, occurring less than a month after a similar near-miss over North Carolina [CW, Nov. 12], comes at a time when the Federal Aviation Administration (FAA) is under severe criticism for allegedly lax air traffic safety controls.

At 9:14 a.m. on Nov. 27, the Euless ARTCC's main computer — an IBM 9020D CPU, which furnishes alphanumeric data to air traffic controllers' radarscopes indicating each airplane's altitude, ground speed and flight number — went down for four minutes, according to George Burlage, public affairs officer for the Southwest Region of the FAA.

Two minutes passed after the digitized data was restored, and at 9:20 a 20-second "interruption" of the system again caused the loss of digitized "data blocks," Burlage said.

It was after the final restoration of the digitized data that one air traffic controller saw the two 727 passenger jets converging with an estimated one mile of horizontal separation and 600 feet vertical separation.

The planes were both flying from the East into the Dallas-Ft. Worth Airport, one originally traveling at 28,000 feet and the other at 31,000 feet. With the

(Continued on Page 4)

GSD Systems Get Price Reductions

By Tom Henkel
CW Staff

ATLANTA — Following the lead of its big brother Data Processing Division, IBM's General Systems Division (GSD) has cut purchase prices for main memory and hardware on four of its systems.

Memory prices were reduced by up to 33% on the Series/1 4955 processor, System/3 models 8, 12 and 15, System/32 and System/34.

CPU purchase prices were cut 15% on the System/3 models 12 and 15, the System/32 and lower end models of the System/34 (those with 8.6M, 13.7M or 27M bytes of storage).

IBM announced similar main memory and CPU price cuts for its larger 30 series of processors, produced by the Data Processing Division in early November [CW, Nov. 5].

Since IBM did not cut lease and rental fees in either case, the price cuts were probably designed to motivate more users to buy their systems, industry analysts said. This move would bring higher profits for IBM.

More users buying CPUs would also tend to stabilize what has become an unsteady market for IBM, since many users are reluctant to buy systems for fear that faster, cheaper machines will be introduced soon, the analysts explained.

Although GSD profits may increase as a result of its price cuts, the analysts said that wasn't the main reason for the move. Increased purchases from mainly small-

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January Workshop to Begin Tackling University Curriculum for Business DP

By Jeffry Beeler
CW West Coast Bureau

POMONA, Calif. — Even though business DPers constitute by far the largest portion of the computer-literate population, most universities still treat business DP merely as an adjunct to computer science rather than as a discipline in its own right. So said Dr. Tom Athey, chairman of California State Polytechnic University's Information Systems Department.

Athey views business DP and computer science as fundamentally different fields and thinks universities should acknowledge that fact by teaching one subject independently of the other. Unfortunately, he said, no one has yet developed any standards for what a good business DP curriculum should entail.

So last year, Athey and some of his colleagues decided to take the educational bull by the horns and began laying the groundwork for what is expected to be the U.S.'s first model business DP curriculum for the 1980s.

Next Jan. 24-25, their curriculum-design efforts will enter a new phase with the start of the Second Annual Business Information Systems Curricula Development Workshop here. Cosponsored by Cal Poly and the Data Processing Management Association's (DPMA) Education Foundation, the conference is reportedly being held for two reasons:

- To decide what standards undergraduate business DP programs should meet in preparing their students for jobs as systems analysts and programmers.
- To establish the business information systems field as a formal educational discipline, equal in standing to computer science instruction.

Athey and his colleagues envision their two-day workshop as a forum that will give representatives of both industry and the academic world an opportunity to exchange ideas about model curricula and explore questions like:

- What should introductory DP courses cover?
- What systems concepts should be taught?
- How can information systems departments obtain needed educational material?

Model Curriculum

Conference organizers see the upcoming workshop not as the climax of their curriculum development project, but as its starting point, Athey said. After the meeting ends, organizers and participants will review their findings in an attempt to produce a set of concrete proposals.

From these recommendations will ultimately come a finished model curriculum, which is scheduled to make its public debut in 1981 at the National Computer Conference.

Athey and his cohorts decided to undertake the curriculum development project after concluding that most established professional societies like the Association for Computer Machinery (ACM) had failed to adequately address business DP interests and needs.

Like many of his colleagues, the Cal Poly professor divides the computing education field into three sectors: computer engineering, computer science and business information systems.

Computer engineering, he said, concerns itself with the design of computing circuitry and architecture; computer science, with the development of systems software and the optimization of hardware performance; and business DP, with the preparation of management and user information.

Unfortunately for the other two areas, computer science instruction has traditionally dominated the attention of organizations like the ACM, with their strong technical and theoretical bent. As a result, the business information systems field and its relatively pragmatic issues have often gone largely unnoticed in many of the industry's most influential professional societies.

To alleviate this perceived neglect of business DP instruction, Athey contacted Don Price, president of the DPMA Education Foundation, about the possibility of forming an information systems curriculum that would serve as a standard for all two- and four-year undergraduate programs. Athey sought DPMA's backing for the project, he explained, because he knew the curriculum would stand little chance of becoming a nationwide standard unless it gained the stamp of approval of an established, recognized professional society.

Price and his organization eventually agreed to cooperate with Athey's scheme, and together DPMA and Cal Poly set out to develop a model curriculum that would give business DP education the same legitimacy that computer science had already received from ACM.

More information about the proposed curriculum or the upcoming Business Information Systems Curricula Development Workshop is available from Athey at the Information Systems Department, California State Polytechnic University, Pomona, Calif. 91768.

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PRESIDENT

Guess who was just re-elected "Chief Executive of Sorting" with 62% of the vote.

(The Hon. SyncSort OS!)

Call (201) 568-9700.

Ask for a copy of IDC's sort survey.

Who'll win the biggest prize in American politics next year? Will it be Jimmy, Ted, Gerry, Jerry, Bob or Big Jawn? Or some Dark Horse crouched hopefully in the wings?

Frankly, we haven't the foggiest notion about *that*. But — fearless as ever — we will go out on a limb and make the following astonishing prediction: *None of the above will get as much of the popular vote as SyncSort just received in its election.* (Remember, you read it here first!)

Because this year — for the third time in a row — SyncSort OS won the "Great Sorting Election" by an overwhelming margin. Of the 4,000 OS and OS/VS users in the U.S., a whopping 62% — or 2,480 — chose to sort with SyncSort. (Not bad for a sort program that started out in a log cabin!)

And what about our competitor? Well, it's bad news for the three OS sorts sponsored by the Distinguished Gentleman from the Great State of Armonk. Together they only received 29% of the vote — down from 42% the year before.

The figures quoted are taken from the third annual sort-program survey conducted by the International Data Corporation. Here's what they found out about sort-program distribution in America:

	U.S. Market Share — Percentage		
	July 1, 1977	**July 1, 1978**	**July 1, 1979**
SyncSort	**43%**	**54%**	**62%**
IBM	**53%**	**42%**	**29%**
Other	**4%**	**4%**	**9%**

If you'd like a copy of the full report, please let us know. It's available to everyone, including IBM and hopeful politicians.

Why does the voting public prefer SyncSort OS by 2 to 1 over IBM's 5740-SM1, 5734-SM1 and that old "freebie" SM023? Well, we just have to fall back on that political cliche — leadership and performance in office.

Leadership because over the past decade we've come up with almost all the advances made in sorting. As a result, we're increasingly known as "*the* sorting house." And that hasn't hurt us a bit at the polls.

Then there's performance. If you benchmark SyncSort against any IBM sort, you'll notice a sharp decrease in the amount of computer resources that go into sorting. On average your "sorting taxes" will drop 20 to 50%

And do you know anyone who'll fight for higher taxes?

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Calls System 'Best in World'

FAA Sticks Up for U.S. Air Traffic Control

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — The country's automated air traffic control system is "the best in the world" in spite of its "inevitable" system failures and interruptions, according to Quentin S.C. Taylor, deputy administrator of the Federal Aviation Administration (FAA).

In a statement prepared as the basis of Taylor's testimony before the House Ways and Means Subcommittee on Oversight two weeks ago, [CW, Dec. 3], Taylor stressed that the FAA is "doing all [it] can to aggressively seek out the causes of system interruptions and to cure them.".

The hearings on aviation safety were called, after two passenger jets carrying a total of 208 people nearly collided in mid-air over North Carolina Oct. 31 after a computer failure at the Leesburg, Va., Air-Route Traffic Control Center (ARTCC) [CW, Nov. 12]. The day after the hearings took place, a similar near-miss occurred over Texarkana, Texas (see story on Page 1).

While the FAA recognizes that system outages will occur, it maintains "a high level of controller skill and training . . . to safely deal with the difficulties associated with the transition from one mode of air traffic [control] to another," Taylor claimed.

In discussing the history of automated air traffic control, Taylor emphasized the sophistication of today's narrowband radar system with digitized alphanumeric data as opposed to the pilot-controller voice communication-based system in use until the end of World War II.

While acknowledging that transitions between automated and broadband systems entail mental as well as physical adjustments on the part of controllers, Taylor argued "it is clear that transitioning from RDP [radar data processing] to broadband radar is far preferable to the situation just five years ago when system failures in broadband required a transition to manual control as the only backup system."

Start-Overs vs. Outages

Taylor distinguished between "unscheduled start-overs" — system interruptions of less than one minute — and "outages" — interruptions lasting one minute or longer and possibly resulting in the complete loss of narrowband radar data.

Unscheduled start-overs can occur when a system element malfunctions and is automatically replaced with a standby unit, Taylor explained. The information on the radarscope does not disappear when a start-over occurs; rather, the last known aircraft data are simply not updated.

"In this way, the effect on the controller is minimized," he said, noting that digitized radar information is normally updated only once every 10-12 seconds.

Start-Overs Reduced

Furthermore, he said, as a result of the FAA's continuing technical efforts, "we have reduced the number of start-overs from 15-20 per week just two years ago to the present level of about seven per week per center."

Unscheduled start-overs are caused primarily by hardware failures and software "problems," which the system is programmed to detect in order to prevent the presentation of erroneous data to a controller, Taylor explained.

"Consequently, when the system detects erroneous data which could mislead the controller, it either corrects that data with no interruptions or flushes that data from the system by inducing a start-over," he said.

Therefore, start-overs are in themselves "beneficial," he contended, since "it is readily apparent that providing erroneous data to the controller could have disastrous effects."

Interruptions of more than one minute are "of more concern," however, Taylor claimed, because most result in the total loss of alphanumeric data to controllers and therefore less efficient controlling of air traffic.

At the Leesburg, Va., facility, outages have occurred at the rate of about one each week, he said, with an average duration of approximately seven minutes.

Safety Concerns

"Recently, there have been blanket charges made that system interruptions pose a hazard to aviation safety," Taylor noted. "While it is understandable that interruptions might raise concerns about safety, the reality is that the system itself, as well as air traffic procedures, is designed to accommodate interruptions without creating safety problems.

"I would like to reemphasize that it is not possible to completely eliminate system interruptions in any computer system — particularly one which is as complex and sophisticated as ours," Taylor claimed.

Conceding that is not "a desirable situation," and that any shift in operations can increase the possibility of a system error, Taylor went on to describe the FAA's plan for improving the existing situation.

Taylor described the FAA's ongoing training program for air traffic controllers, which includes simulated system failures and the resulting transitions between broadband and narrowband radar.

Since 1977, the FAA has refined its reporting system for interruptions to provide "a better management tool to address the problem," Taylor said. System software is now tested five times instead of one and at two locations instead of one.

The agency has "tried to improve [its] response time" to system problems, has provided "new and more advanced test equipment" and has improved lightning protection at centers to reduce the possibility of power failures, Taylor explained.

Planned Measures

The new Direct Access Radar Channel (Darc) automated system will serve as the futue backup to RDP, providing limited data blocks, altitude readout, weather, maps and an improved display over broadband. And in the mid-1980s, the FAA hopes to install an Electronic Tabular Display System (Etabs) to replace the present flight strip printers with electronic displays and touch-entry devices, Taylor said.

But before the end of 1982, the FAA hopes to implement an Automated Data Distribution System to provide an electronic data transmission system for transmitting computer tapes to field facilities.

And in the mid- to late 1980s, "we are planning to replace our entire existing network of air traffic control computers at a cost on the order of $1.5 billion . . . which may well be the biggest computer project ever undertaken," Taylor said.

Two Jets Nearly Collide After DP Failures

(Continued from Page 1)

data blocks still showing, the aircraft at 31,000 feet asked for clearance to descend to 24,000 feet and got the "go ahead," Burlage said.

Moments later, the plane traveling at 28,000 feet also asked to descend "for smoother weather" and also got the go ahead, Burlage said. Very soon after that, the controller saw the two planes converging, indicated by the data blocks on his radarscope, and took evasive action.

With the incident still under investigation, there are two theories circulating on the cause of the near-miss, Burlage said. Some speculate that a mechanical malfunction may have caused the disappearance of one or more data blocks on the radarscope while others were still displayed.

Others theorize that, while working with broadband nondigitized radar only — which does not indicate altitudes — the controller simply may have forgotten that he had given the first plane clearance to descend. According to this theory, it was only after the restoration of digitized data that the controller was aware of the potentially disastrous situation.

Examination of the recorded voice tapes of the controllers is expected to indicate whether the controller who gave the second jet permission to descend was working with the digitized altitude information.

Reported Downtime

While Burlage claimed the center is "relatively free from computer downtime," with average failures of four minutes' doration once a week, he noted there have been failures of up to 17 minutes at times. Two days before the near-miss, a power fluctuation caused the system to go down for an hour and 20 minutes, he added.

When asked whether the two outages were related, Burlage said investigators "are trying to relate them." Although the exact cause of the 20-second interruption on Nov. 27 is not known, the initial four-minute outage has been attributed to a malfunction in the storage element of the computer display channel — an IBM 9020E that does radar processing and tracking functions that are then digitized by the 9020D, Burlage explained.

Possible causes of the 20-second malfunction include the computer's rejection of "wrong data" — data in the wrong format — or a bad memory card.

Correction

Additional comments on the data base question discussed in the Nov. 26 In Depth article on "IBM Data Base Surprises??" are contained in the November 1979 issue of "Data Base Newsletter," which is available from Performance Development Corp. — not Professional Development Corp. — at Building P, 1101 State Road, Princeton, N.J. 08540.

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Judge's Remarks Cause Delay Of MCI vs. Bell

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — The trial of MCI Communications Corp.'s massive antitrust suit against the Bell System was put off for two months last week to offset possibly prejudicial remarks by the judge, John F. Grady.

In a pretrial order, Grady said MCI's witness list "seems to contemplate an efficient presentation of the evidence," but AT&T's much longer list "persuades me that [the] defendants' approach to the case is grandiose."

After these comments were published by the *Chicago Sun-Times*, Grady decided they might be an "impediment to the selection of an impartial jury." He ordered the process deferred until Feb. 4, apparently hoping the story and his remarks will be forgotten by then.

MCI has accused AT&T and its operating companies of monopolizing the point-to-point, private-line "business and data communications services market" in violation of the Sherman Act by refusing to interconnect some Bell facilities with those of MCI and imposing arbitrary restrictions in other cases.

It also accused Bell of engaging in a variety of anticompetitive marketing practices. For example, "under the guise of an independent survey," AT&T allegedly has asked prospective and already signed-up MCI customers whether they would accept lower priced services from the telephone company and then described new, "competitive" services to be offered by Bell in the near future.

AT&T also stands accused of using a "quantity discount pricing structure . . . which makes it economically impractical for a customer to divide his total business and data communications" between Bell and MCI.

Other charges made by MCI: the phone company has announced new data and voice services far in advance of the time they became available, at rates significantly below those charged by MCI for similar offerings; Bell has prolonged federal and state regulatory proceedings to keep MCI out of new markets; and Bell has engaged in a "massive public propaganda campaign . . . falsely and continuously" asserting that "the interconnection sought by MCI would result in technical harm to the national telephone network and . . . economic damage to the Bell System and its public subscribers."

Bell Countersuit

Bell responded to these charges by filling a countersuit which accuses MCI of engaging in many of the same practices. The first, and major, count of the complaint is directed at MCI Communications Corp., the holding company for several operating subsidiaries (for example, MCI-New York West, Inc., which operates between Chicago and New York City; MCI Telecommunications Corp., serving Toledo-Detroit, Dallas and several intermediate cities; and Interdata Communications, Inc., serving New York, Baltimore, Philadelphia and Washington).

MCI's holding company is accused of milking the subsidiaries by forcing

(Continued on Page 6)

AT&T Found Guilty of Antitrust

CW Washington Bureau

WASHINGTON, D.C. — AT&T and two subsidiaries were found guilty late last month of violating the Sherman Antitrust Act in a case involving many of the same practices over which MCI Communications Corp. has sued AT&T.

The decision also may provide the Department of Justice with additional ammunition in its pending suit to break up the Bell System.

On Nov. 21, a federal district court jury in Bridgeport, Conn., decided unanimously that AT&T, Southern New England Telephone Co. and Western Electric Co. were guilty of all the anticompetitive acts charged by Northeastern Telephone Co., a key telephone and PBX supplier.

Charges Against Bell

Northeastern had charged that Bell priced terminals below cost to discourage competition; charged discriminatory rates for service to customers who used Northeastern terminals; ran ads designed to cast doubt on the quality and reliability of independently manufactured terminal equipment; and announced products long before they became available to prevent customers from considering similar competing products.

Furthermore, Bell was charged with over-designing the protective coupler interface required prior to June 18 for linking independently made interconnect terminals to the dial-up networks in order to increase the cost of the coupler and make interconnect equipment more expensive for the end user.

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Rises in DPers' Pay Close to Carter's 7% Limit

(Continued from Page 1)

at 7.10%, the survey found.

"The fact that employers were able to hold to a 7.5% increase in this period of dramatic inflation is commendable and certainly close enough to the President's guidelines," according to Philip G. Henderson, a Hansen vice-president.

Most DP professionals received promotions in the past year, Henderson said. Hence, many DPers garnered a 10% to 12% salary increase without violating the Carter plan, which only pertains to salary raises within a given job category, he explained.

The salary for an organization's top DP executive rose 10.1% to an average of $41,700, the survey found. The highest paid person reported in that position earned about $100,000 annually in direct compensation.

Hansen obtained salary data from 1,510 DP installations reporting on 117,895 employees. Among the users Hansen investigated were AT&T, the Coca-Cola Co., six Federal Reserve banks, McGraw-Hill, Inc., the San Diego city schools and *The Dallas Morning News.*

Several cities exceeded the 7.5% nationwide average increase, the survey noted. In Denver, DPers earned 15% more; salaries were up an average of 12.2%, 11.8% and 8.3% in Minneapolis, Milwaukee and Dallas, respectively.

In contrast, large northeastern cities such as Boston and New York generally experienced less salary movement, Henderson said.

National Averages

The Hansen survey listed the following salaries as national averages for specific DP positions: assistant manager of corporate DP, $34,200; manager of DP administration and planning, $31,500; regional or division DP manager, $33,600.

A Few Definitions

A.S. Hansen, Inc.'s "Weber Survey on Data Processing Positions" uses a number of DP job names that may overlap, appear redundant or simply not jibe with some peoples' perspectives.

Hansen drew the following distinctions:

- A *corporate DP manager* is an organization's top DP executive. Under him may be several *divisional* or *regional* DP managers.
- A *manager of systems analysis and programming* directs the various grades of *systems analysts/programmers*. The *lead analyst/programmer* has some supervisory duties, whereas the *senior analyst/programmer* is allowed to work on his own most of the time.
- *Applications programming* is directed at solution of business, scientific or engineering problems. *Software programming* involves development of utility programs, job control languages, macros, subroutines and other software that may be transparent to the end user.
- By *DP operations*, Hansen means literally the processing of information at various levels of automation. *Computer operations* refers to support of computer hardware and software. Hence, the computer operations manager may report to the DP operations manager.

Other national averages: manager of systems analysis and programming, $30,300; lead systems analyst/programmer, $25,300; senior systems analyst/programmer, $22,300; systems analysis manager, $29,700; lead systems analyst, $25,600; and senior systems analyst, $23,400.

The nationwide average salary for an applications programming manager was $26,700, Hansen stated. National averages for lead and senior applications programmer, manager of software programming/analysis and lead software programmer/analyst were $23,200, $19,600, $30,000 and $26,300, respectively.

DP operations managers responsible for programming activities earned $31,800 nationwide on the average, but DP operations managers without such authority earned $27,300.

The burgeoning data base management area sported a $28,500 average for managers and a $24,900 average for senior data base analyst/programmers.

The Bonus Situation

However, bonuses in addition to salary yielded a significant portion of many high-level DPers' total income, Hansen pointed out. Where bonuses were given, corporate DP directors received an average bonus worth 17.5% of their salaries; divisional or regional DP managers received 14.6% of their salaries as bonuses; and managers of systems analysis and programming got an extra 12.6% of their salaries in this way.

Some observers of the DP income situation view bonuses and "perks" as a ruse to sidestep the Carter clamp on soaring salaries.

On the other hand, the President's Council on Wage and Price Stability has given users a more direct means of avoiding the 7% lid. The council exempts from the 7% lid job categories for which employers can document labor shortages. DP professionals are considered to be in short supply.

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(Continued from Page 1)

does not harm people, nor does it harm the environment. . . . It has . . . been estimated that for each dollar of added GNP [Gross National Product], the telecommunications industry uses one-tenth of the energy used on the national average.

"Clearly, there are opportunities to displace . . . high-energy functions, such as travel. . . . Our productivity [in the telecommunications industry] has improved at three times the national average."

'Sensitive' Areas

To keep the technological revolution from slowing down or getting sidetracked, however, Ross listed some "areas in which I believe we must be particularly sensitive."

One of his concerns, apparently, is that the government will spend too much on applied research and not enough on basic research: "We have an obligation to devote adequate resources to the search for basic knowledge — to provide the information to support the needs of users 10 and 20 years from now. [While] basic research and development is strong in telecommunications today . . . there is concern about the emphasis in other industries on low-risk, short-term needs at the expense of long-term needs. We must be alert to assure that this does not happen in our technology-based industry."

Ross' other major concern is the "forthcoming new balance between completion and regulation." Pointing out that "the manufacturing of telecommunications equipment has always been a competitive arena" while "provision of certain services has been regulated," he observed that "the balance between competition and regulation has supported a steady flow of innovation in the telecommunications business."

Informed Legislators

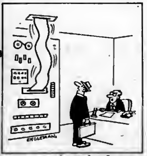
One logical inference from all this is that changing the balance will reduce the innovative flow. A little later, Ross said "there are technical issues involved and we have a responsibility to ensure that the legislators are properly informed on these issues."

He then illustrated what can happen if Congress tries to decide "technical issues" on its own. In 1897, he explained, the Indiana legislature passed a bill that would have changed the value of pi from 3.1416 to 9.2376.

"Had this bill become law, it would have had a profound effect on the quality of life in the state of Indiana," Ross pointed out. "Fortunately, a professor of mathematics who happened to be visiting the state house on an entirely different matter ran across this bill. He talked to the Senators — I suppose you would say he lobbies — and . . . the bill was tabled by the Senate."

The technical issues before the Congress today "are not as profound as changing the value of pi," Ross added, "but they certainly are more complex. We, the telecommunications engineers, have a responsibility to inform Congress on these technical issues to be sure that the decisions they make will serve us well in the future. . . .

"Of course, we do not want the engineering profession to interfere in politics, but also we do not want politics impeding the beneficial application of telecommunications," he said.



'We Have to Share Our Computer With the Office Upstairs.'

MCI vs. AT&T Postponed

(Continued from Page 5)

them to accept "unwanted or unneeded services" and of forcing subsidiary stockholders, by use of its "dominant financial position," to give up their managerial control.

Bell also charged MCI Communications Corp. with filing its antitrust suit "further to hinder [the Bell System's] ability to compete in the relevant market and as a part of [MCI's] attempt to monopolize that market."

Bell and MCI are each seeking treble damages for their alleged injuries, plus court orders barring various practices.

Both suits are being tried by the U.S. district court in Chicago. MCI plans to put 17 witnesses on the stand, while AT&T will use at least 183.

MCI has filed a second antitrust suit, in the Washington, D.C., federal district court, against Bell, the U.S. Independent Telephone Association and the major independent telephone companies. This one which won't come to trial for several months, accuses the defendants of monopolizing the market for switched and nonswitched intercity telecommunications services and of distributing the "resulting illegal profits" through the settlements process.

In its Washington suit, MCI is asking for $1 billion in damages.

But Criminals Can Still Be Caught

Security Expert Sees No Way to Stop DP Crime

By Tim Scannell
CW Staff

BOSTON — While security passwords, codes and data encryption devices may strike fear in the hearts of novice DP criminals, there is virtually no way a company can stop an experienced thief from accessing and stealing a system's data.

However, if the company knows what information was taken and at what time the theft occurred, it can almost always track down the computer culprit, according to Dennis Huaman, an internal security specialist with the General Electric Co.

Speaking here last week at the International Conference of Wang Users, sponsored by Wang Laboratories, Inc., Huaman addressed the problem of computer system security and detailed a number of ways managers could darn obvious holes in their security blankets. Although hundreds of people were at the annual meeting, only about seven showed up for the security session.

Three Types of Crooks

Huaman identified three basic types of DP crooks, each of whom inflicts a particular form of damage on the computer system. The first — and the most dangerous — is the oser who is determined to "get back" at the company or steal certain pieces of information from the computer system.

Usually knowledgeable, members of this class of thieves will probably stop the CPU's internal clock before entering the system and restart it after the data is taken. He might also pull the plug on the computer's software-based audit trail or even erase a portion of the disk containing the system's usage log, Huaman said.

The second type of criminal is the programmer or systems analyst who has authorization to access the system, but "gets curious and starts browsing" through the system's data base and finds all sorts of things ranging from personnel records to proprietary corporate files.

Then, finally, there is the operator or lower rung DP worker who may or may not have authorization but uses the computer as a private electronic playground, running rounds of tick tack toe and wasting valueable system time by processing interoffice bowling scores.

Most Vulnerable Time

Although stealing data directly from a computer without anyone knowing it is probably the most widely publicized and romantic type of DP crime, most of a company's data is actually taken when it is transmitted to other sites or transferred to hard copy, Huaman said. Information is at its weakest security level when it leaves the bosom of the processor.

Alluding to last year's multimillion dollar theft from California's Security Pacific National Bank [CW, Nov. 13, 1978], Huaman claimed that most communications systems are vulnerable because they rely on passwords or a series of codes for security. When these codes are broken, information can be filtered off gradually and its absence not discovered until days or weeks after the actual crime.

Adding to the problem is the ambiguity of the value of computer data, especially from a legal standpoint, Huaman said. Since a company can't easily assign a dollar value to its corporate data, it can measure its worth only by how much it would cost to replace and how much of an edge a competitor gains by

(Continued on Page 8)

A Hint of James Bond

By a CW Staff Writer

BOSTON — Like dog owners who sometimes seem to resemble their pets, conference rooms occasionally seem to fit a speaker's topic.

One of the sessions at last week's International Conference of Wang Users, for instance, focused on computer security. While it required a bit of imagination, the room in which the session was held offered more than a hint of James Bond.

A little bigger than a large closet, the room seemed to be totally sound and air-proof when both doors were closed. Its main entrance was guarded by a surly-looking individual who sat by a telephone throughout the lecture, and the door to his right sported a one-way peep hole that was perfect for spotting unwanted visitors.

The speaker, Dennis Huaman of General Electric Co., ended his lecture 15 minutes early because of an overactive heating system and invited audience members to ask questions and draw upon his private and governmental security experience. No one took him up on his offer.

Huaman then picked up his briefcase and walked out the door, followed by his mysterious companion. Just like they do in the movies.

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Training Claims Only 1.4% of Average Budget

(Continued from Page 1)

The application programmers plummeted, on average, from 14.2 days of training reported in 1978 to 9.6 days this year. BSI said this drop could be attributed to two factors: first, most moderate-sized organizations believe they have already trained their staff members in structured design and programming, so programmer training is reduced. Second, many organizations have a severe shortage of good programmers, and managers are refusing to let those people go to training.

More than 200 organizations responded to BSI's questionnaires when they went out in August and September, a sharp increase from the 98 organizations that answered the 1978 survey conducted some 18 months earlier.

This year's round of questions was comprehensive enough to require two to six hours on the part of each respondent. It was divided into three basic sections: looking at the respondents, their organizations and their jobs; looking at budgets and spending patterns; and looking at the training vendors the respondents use.

BSI's interest in the results is natural enough. The company offers a spectrum of instructor-led classroom-oriented courses in the DP area.

DP Training Directors

When BSI asked respondents for their position or title, more than half reported they are formally DP training directors. Other titles cited showed there is a strong interest on the part of top management in the issues addressed in the survey.

BSI also commented that it expects to see human resource development and training specialist positions rising within the DP ranks as their activities are recognized as significant to improving productivity and cutting high turnover rates.

With an average of 288 people in the DP organizations reporting, the DP training director's salary averaged $25,075 but ranged from $8,800 to $45,000. Pay raises for them did not keep pace with inflation, BSI noted.

The survey team also noted that the lack of management training — managers got only 6.4 days of training this year — may account for the criticism of DP management as lacking professionalism compared with their counterparts in other departments within their companies or organizations.

At the other end of the professional scale, BSI found that 85% of the respondents reported they provide entry-level training for people coming into the DP organizations.

The BSI spokesman commented that respondents were typically large organizations, and the budget figures seemed to bear that out. The average total DP budget (with 130 organizations reporting) was $12,285,769. The average DP training budget for the same group of respondents was $172,290.

The old feeling that when money gets tight, the DP training is the first to go just doesn't hold true anymore. Sixty-five percent said if downward changes are needed, training is cut in proportion with the rest of the budget, but 70% added that they, in fact, anticipated growth in their upcoming budgets.

When asked about what vendors they use, 71% said they use on-site training supplied by outside firms, but this was a 10% drop from 1978.

When asked in what subject areas they were having difficulty finding quality outside vendor training, more than half said they had no problem finding instruction in any subject. Specific problem areas reported by the rest were scattered among IMS, systems analysis, "top management," operator training, data communications and systems programming, but none of these received more than nine "votes" as a trouble spot.

When the surveyors asked to which multimedia-training vendor the training directors would turn in each of nine categories, Advanced Systems, Inc. got the nod in five, while Deltak, Inc. was the leader in the other four.

When the question was focused on "standard" training vendors, BSI ranked on top in two cases; Yourdon, Inc. led another; but IBM "took" six of the categories.

Copies of the 20-page survey results are available from BSI at 4720 Montgomery Lane, Bethesda, Md. 20014.

GSD Cuts Memory, Hardware Prices

(Continued from Page 1)

time users probably won't net IBM mammoth profits — unlike the price cuts on the 30 series, which may result in handsome profits from top-of-the-line 3033 users who find it cheaper to buy multiple 3033s while waiting for IBM's long rumored H series of supposedly cheaper and more powerful CPUs.

Instead, the analysts theorized, GSD has another announcement up its sleeve. Since it would almost be impossible for GSD to show any kind of fourth-quarter profits resulting from the price cuts — because of their late announcement — analysts feel the decrease presages a first-quarter 1980 announcement of either a high-end addition to the 4300 line or a mid-sized CPU that will offer more power than the System/34 but less power than the troubled System/38, which IBM has had trouble getting off the ground because of problems with 64K memory chips.

IBM watcher Robert Fertig, president of the Technical Analysis Group at Advanced Computer Techniques Corp. in New York, agreed the GSD price cuts are a forerunner to either a System/35 or System/36 announcement.

Further delays in System/38 shipments will be the prime motivation behind a mid-sized system announcement. Fertig thinks the System/38, which has already been delayed six to nine months, will be delayed another three months.

In order to protect its user base and provide a mid-sized machine to System/3 and System/32 users that can't wait for the System/38, IBM will be forced to make the announcement in mid-winter, according to Fertig.

However, he ruled out the possibility of an imminent announcement of a high-end addition to the 4300 series. That announcement will come in early spring, he said.

Fertig also disagreed with other IBM watchers who said the GSD price cuts will not have a dramatic effect on IBM's profits. Fertig expects IBM to do very well as a result of the price cuts.

IBM declined comment on the price decreases, saying only that "the price reductions are a result of a normal business review.

No Way Seen to Halt Thefts

(Continued from Page 7)

having the data.

Huaman stressed that companies can thwart computer criminals by centralizing operations as much as possible, encrypting transmitted data, using codes and passwords and limiting computer and terminal access as much as possible.

On the subject of hard-copy and computer printouts, Huaman stated that he has learned more about a company and its internal structure by sifting through its garbage than he could if he tapped its computer files directly. Contract proposals, program listings, internal memos and even interoffice love letters casually tossed on the rubish heap have not only spelled out what's going on within a company, but where that company is headed and with whom it is doing business, Huaman observed.

All documents should routinely be destroyed or at least screened before they leave the confines of the corporate walls, he said.

Finally, the security specialist cautioned his audience to consider the responsibilities and potential dangers of taking on government contracts or working with federal agencies. If an individual petitions the government for certain information under the Freedom of Information Act or similar legislation, then the company could become involved and be forced to bare its corporate soul.

What's even worse is that the firm might have to supply a detailed record to the person stating when a file was created, how many people inquired about the file and if and when the file was corrected, Huaman said. Most companies don't get that involved with their audit trails, he noted.

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Solves Linear Programming Problems

Experts See DP Promise in Soviet Algorithm

By Jeffry Beeler
CW West Coast Bureau

PALO ALTO, Calif. — Investigators have only begun to explore the implications of a recent Soviet mathematical breakthrough, but some experts are already "optimistic" the discovery will find widespread DP application, according to computing expert Dr. Ronald Graham.

The breakthrough by Russian mathematician L. G. Khachian is still so new and original that no one is sure yet exactly how users will ultimately benefit from the discovery, said Graham, who heads Bell Laboratories' Discrete Mathematics Department at Murray Hill, N.J.

For the moment at least, the development is mainly of interest only to theoreticians and computer scientists, but attempts to unearth its potential applications will probably begin to bear fruit sometime during the next year or so, Graham said recently at Stanford University, where he is serving this academic quarter as a visiting professor of computer science.

In a telephone interview here, the Bell Labs researcher described Khachian's discovery as possibly equal in significance to the invention of lasers. When lasers first burst on the scene a number of years ago, they aroused tremendous scientific curiousity, but the full extent of their usefulness was not appreciated until much later.

Today, Khachian's breakthrough is likewise in its infancy, and many — though certainly not all — experts suspect it will eventually prove as broadly useful in computing as lasers have been in so many other fields, Graham explained.

Problem-Solving Shortcut

In essence, the Soviet discovery provides a mathematical shortcut for solving linear programming problems, which rank among the most important in all of computing. Some linear programming problems involve thousands of variables manipulated in millions of combinations and are so complex they require years to solve, even with computers.

In the past, most efforts to tackle linear programming problems have relied on a mathematical procedure known as the "simplex algorithm." Developed by Stanford computer scientist Dr. George Dantzig, the simplex method represents computational problems as many-sided, multidimensional figures in which each vertex corresponds to a possible solution.

Under the method, a computer examines the vertices one at a time and then picks the one point that represents the best combination of all the variables.

For the overwhelming majority of linear programming problems, the simplex method has long served as the favorite method of solution, and its preeminence is unlikely to be seriously challenged by the advent of the Khachian algorithm, Graham predicted.

Even so, computer scientists long ago realized they could contrive "pathological" problems for which the simplex procedure was found to be totally inadequate, he said. These problems entailed such an unimaginably immense number of calculations that they proved all but theoretically impossible to solve.

The Khachian algorithm, by contrast, circumvents this "exponential blow-up" of computational steps by providing computer scientists with a "very different way of looking at and approaching" linear programming problems, Graham explained. Instead of visualizing problems as complex polyhedra (as the simplex method does), the Khachian algorithm uses N-dimensional ellipsoids in its representations.

The technique surrounds the solution to a linear programming problem with successively smaller ellipsoids until it finally isolates the answer. In this way, the algorithm "allows you to examine large chunks of a problem at one time and lets you zoom in on the solution" in considerably fewer steps than the simplex method requires, Graham said.

Contrary to some recent reports, the Soviet algorithm has yet to find any known applications for either weather prediction or cryptography, Graham said.

On the other hand, he continued, the method does show some promise as a possible means of solving "combinatorial optimization" problems, the object of which is to determine the value of a large number of restricted variables in the best possible way. An example of such a problem would be airline personnel scheduling, in which thousands of employees must be assigned job slots and working hours with a minimum amount of waste.

Khachian's method might also be used someday to yield approximate solutions to very difficult problems for which no exact answers are thought to be possible, Graham said. For example, if the New York City telephone company tried to chart the shortest possible route to take in collecting money from its thousands of public pay phones, the new Soviet method could probably come within 10% or so of the right answer — not absolute perfection, to be sure, but close enough for most practical applicaions.

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Congress Pushing Justice Toward Automation

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — After years of frustrated hairpulling over inadequate Justice Department management information systems, Congress is now vigorously prodding the department to develop useful automated recordkeeping practices.

For almost 10 years, the department has been trying — for the most part unsuccessfully — to develop comprehensive litigation information systems to better account for the time and money spent by its Criminal, Civil Rights, Antitrust, Land and Natural Resources and Tax Divisions.

But even with the little systems work already under way, "the information systems implemented or under development vary in format and level of detail. Thus, uniform data on litigation activities will not result," Congress' General Accounting Office (GAO) reported recently.

An Old Story

To the House Government Information and Individual Rights Subcommittee, which requested the GAO study, the story is an old one.

"The shortcomings have been known for years," Subcommittee Chairman Rep. Richardson Preyer (D-N.C.) told the House last month. In 1973, Justice abandoned a three-year effort to develop a system that would provide detailed data from the U.S. Attorney's Office on cases pending, he noted.

"Under a Justice Information Management Systems, there was supposed to be data on the cases' change of status and sentencing. But the system was halted in 1973 because dates were not being entered and the computer was not working right.

"In 1974," Preyer continued, "a new Automated Case Load and Collection System was launched to, among other things, keep track of cases referred to U.S. attorneys and determine how complex they were. However, in July 1978 an internal audit report determined that a feasibility study of the system had never been done, nor had objectives been established.

"Also, the system had technical and performance problems. The GAO estimated that more than $2 million had been spent on the system, but now, because of the problems, there are no plans to establish it nationwide," Preyer said.

Congress Hampered

The House subcommittee is pulling its hair because the Justice automation problems have hampered Congress in its oversight and budget functions. As the GAO pointed out, uniform data collected into a usable data base "would no doubt alleviate some of the past problems Justice has encountered in supplying budget and cost data supporting resources requests."

Furthermore, lack of data has thwarted congressional attempts to determine how much fraud has been committed against the government, Preyer said.

In another example, "the Senate Committee on the Judiciary tried to find out how many outstanding judgments or fines the Justice Department could collect, and the department's estimates ranged vaguely between $500 million and $1 billion," he said.

That $500 million equivocation and similar experiences in trying to wrest information from the department have prompted the Preyer subcommittee to undertake a detailed study of how Justice procures and uses information technology and services [CW, Nov. 19].

'Residual Resistance'

The GAO reported that some of the delays in implementing acceptable litigation management information systems stem from earlier attempts that involved cumbersome and unsuccessful reporting techniques, leaving a "residual resistance" to the automated systems on the part of Justice Department attorneys.

For the last two years, however, top management backing for the systems has increased, and as recently as last February then-Attorney General Griffin Bell directed the "immediate formation" of a management system task force.

But, as Preyer noted, "so far it has launched no offensive. Today, despite the outlay of $1 million, the efforts of the various litigation divisions may be several years away from completion."

But the future isn't entirely bleak. "In the meantime, most of the divisions are at last establishing systems of timekeeping — even though they differ — which will be somewhat useful for budgeting," Preyer said. "Also, most of the divisions have automated or plan to automate case files, which will allow for more ready retrieval of data on individual cases."

In addition, Preyer's subcommittee and the Senate Judiciary Committee have called for the department to submit by Jan. 1 a plan to consolidate information systems.

The GAO is also cautiously optimistic about the prospects for Justice Department automation. "While much remains to be done, Justice is now making an effort toward improving the availability of information on litigation activities," the recent report concluded.

"At present, it is too early to assess the success of these efforts, but considering the past situation, the steps being taken are a move in the right direction."

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But Controversy Not Over

USPS, Western Union Cancel Ecom Contract

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — The U.S. Postal Service (USPS) and Western Union Telegraph Co. last week canceled their 15-month-old agreement to offer Electronic Computer-Originated Mail (Ecom) service. The Postal Service said it would solicit communications facilities for a similar service from all carriers interested in providing them.

The announcement represents a major victory for Graphnet Systems, Inc. and other vendors of competing electronic message services (EMS). They have charged that the Western Union-USPS contract was a sweetheart deal designed to give the telegraph company a competitive edge in the rapidly growing EMS market and protect the Postal Service against an independent Ecom-type offering by Western Union.

But the Ecom controversy may not be over.

Postmaster General William Bolger, in announcing termination of the Western Union contract last week, said the Postal Service still intends to retain control over its future Ecom service offering. To retain this control, USPS would have to resell to the end user the communications facility it leased from carriers.

However, the Federal Communications Commission (FCC) has already ruled the USPS can't offer Ecom without getting the FCC's prior approval to operate as a common carrier [CW, Aug. 6]. USPS has asked the U.S. Court of Appeals to review the FCC ruling, and at the moment everyone is waiting for a decision.

Bolger indicated that invitations to bid on the communications facilities needed to support Ecom will go to prospective suppliers within the next several weeks. He reported that the new service, when launched, will be a commercial rather than a test offering.

The Postmaster General emphasized in his statement that he doesn't see the Western Union contract termination as a defeat.

"We entered into this agreement with Western Union because we determined, after conversations with many companies, that Western Union was the only one at that time that could provide the services required." However, the agreement included a provision, "after 15 months, that would allow us to get competitive bids from all other communications companies that might wish to provide transmissions and data processing services for Ecom."

The failure of the initial arrangement with the telegraph company, Bolger added, was due to "factors beyond our control" — specifically, the drawn-out proceeding at the Postal Rate Commission and the position taken by the FCC.

However, a little later in his statement, Bolger said: "I must also be candid and say that . . . we too have become more knowledgeable about the problems and opportunities of entering into telecommunications.

"We have learned a lot . . . Certain changes in the way we now envision . . . Ecom should meet our customer's needs better."

One such change, apparently, is that the upcoming Ecom service will "be compatible with, and accept input from, the broadest possible number and types of industry-provided computer, word processing, facsimile and related EDP devices now and in the future."

Calendar

Jan. 28-31, Los Angeles — **Cryptography and Data Security.** Contact: Hellman Associates, 730 Alvarado Court, Stanford, Calif. 94305.

Jan. 30-Feb. 1, Washington, D.C. — **The Computer Language: Basic.** Contact: Continuing Engineering Education, George Washington University, Washington, D.C. 20052.

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Programs Machines to Carve Patterns

CPU 'Takes Stock' of Gun Barrels

Clockwise from top: A highly skilled craftsman devises intricate checkering patterns on shotgun and rifle stocks, a job that can take two to 15 hours. These designs are converted into programs and put on magnetic tapes which drive high-speed machines that can checker six stocks simultaneously in four to eight minutes. Final photo is a closeup of a router in action.

Special to CW

WESTWOOD, Mass. — Some things change, yet remain the same.

Closely spaced grooves and patterns are still carved into the stocks of rifles and guns, but at least one weapons manufacturer is now using computers rather than a craftsman to duplicate these intricate designs.

Checkering, as these patterns are called, has always been both a safety feature and an index of a firearm's quality, according to Robert F. Thomas of A.S. Thomas, Inc., a machine tooling company here. The firm uses a Digital Equipment Corp. PDP-11/34 minicomputer to produce magnetic control tapes for Connecticut-based arms maker Winchester-Western.

Programmed with a mostly numerical fixed-format language known as Nuform, the tapes control the actions of a series of multispindle, multiaxis cutting machines that carve diamond-shaped patterns into the wooden surfaces of the rifles at the rate of one weapon every four minutes.

Process Begins

Checkering-tape programming begins when Winchester-Western sends a stock with a handcrafted design and several blanks to the Westwood tooling firm. These stock models and any custom rifles are created by highly skilled artists who work two to 15 hours on each gun's design, Thomas said.

Since each gun stock is an artistic surface that is difficult to define mathematically, A.S. Thomas engineers must first measure the cross-section of the stock blanks at selected intervals in order to create a computer model. The basic design and model are then programmed with the Nuform language and analyzed on a DEC VT-11 graphics display.

The Nuform language is used because it contains no action words, commas, slashes, parentheses or other alphanumeric figures, Thomas explained. Programmers enter stock and pattern data into fixed fields with numeric notations, keeping the input as brief as possible.

Other peripherals that aid in the creation of the carving tapes are eight disk drives with a total on-line storage capacity of 20M bytes; a DEC LA36 printer; a VT-100 CRT terminal; a California Computer Products, Inc. Model 563 X-Y plotter; and a high-speed paper tape reader/punch.

A DEC PDP-11/20 with 32K bytes of memory serves as a satellite processor for the graphics display, removing this burden from the 224K-byte central processor, Thomas stated.

The checkered patterns are initially displayed on the DEC graphics terminal in two dimensions to verify correct input. The pattern then is superimposed on the mathematical model of the stock to obtain a three-dimensional picture to ensure there are no interferences.

To generate the control tapes, the Nuform program and the PDP-11/34 automatically convert coordinates and travel orders into the instructions for the machine tool.

The minicomputer calculates a tool-path plot describing the tool's motion and a tool-point plot defining the cutting head's position.

"The tool must be positioned at the correct angle, otherwise the wood may splinter, lines will not be parallel or the pattern will smear," Thomas said.

Programs are again viewed on the graphics terminal and then plotted in three dimensions.

When all the lines look even and the resolution is correct, the tape is created.

The tape, plot, listings and drawings are then sent to Winchester-Western where they are used on four- or six-spindle milling machines that cut up to six blanks simultaneously.

Of course, there are simpler ways to slice a rifle. For instance, the designs could be reproduced by pressing a heated mold against the blank wood. But the resulting patterns would not be as crisp as hand- or computer-produced checkering and have an unsafe, slippery feel, Thomas observed.

Feds Delay Implementation Of Contested I/O Standards

WASHINGTON, D.C. — The federal government has postponed implementation of four controversial I/O interface standards, which have been the basis of suits brought against the government by four major computer manufacturers.

The standards go into effect June 23, 1980. Three of the standards had originally been scheduled for implementation Dec. 13, while the fourth had been slated for June 23 enactment.

Control Data Corp., Honeywell, Inc., Burroughs Corp. and Univac recently asked a federal court here to block the standards, which they claimed will hurt their government business to the benefit of IBM, on whose architecture the standards are based [CW, Oct. 22].

While no court action has been taken on the suits, the Commerce Department said last Monday it will hold off on requiring the standards for federal computer procurements "in order to assure ample time for issuance of the required procurement regulations."

No Productivity Breakthroughs.

Software Woes of '70s Seen Continuing in '80s

By Jake Kirchner
CW Washington Bureau

ARLINGTON, Va. — Software development in the 1980s will be plagued with the same problems as in the 1970s unless there are some dramatic breakthroughs in managing the end-to-end process — an unlikely prospect at best, according to Rand Corp.'s Dr. Willis Ware.

"In the end-to-end software scene I guess I can't see any big productivity improvements" over the next few years, Ware said recently at the "Computers in the 1980s" conference here. "We're going to live the '70s all over again, and in 10 years we will be saying the same things.

"I'm not gloomy about the '80s," Ware continued, just "cautiously optimistic" that the DP industry will learn to manage software development just a little bit better.

New programming languages, software sharing, structured programming, better programming environments and more programmer access to computers will be beneficial, but the industry will still face consistent manpower shortages and the myriad problems of managing software life-cycle support, Ware said.

'Incremental Improvements'

There will probably be only "incremental improvements" in software development, according to Ware, who proceeded to draw an analogy between hardware and software advances.

"We all know perfectly well the pace of [hardware] technology." The price of unit logic decreases consistently and dramatically "but the black boxes don't get any smaller" and the overall system costs remain about the same, he noted.

The reason, he conjectured, is that we keep stuffing more and more applications into those boxes as it becomes economical to do so.

The same is true for software, he continued. As soon as we learn something new we make it standard, continually pushing forward the state of the art. "We are doing things as fast as we can figure out how to do it" and as fast as the manpower becomes available.

"As long as that prevails," he said, "we aren't going to get any better," and the dollars and time required for software development will remain fairly constant.

Manpower Problem

Manpower will continue to be a major problem, he said. "The university curriculum is simply not turning out the kinds of people we need" — people who after a year or so of apprenticeship can pull their own weight.

In the past, the industry has benefitted from a secondary source of manpower trained in science and mathematics who have had some programming training and have augmented the programmer ranks, and that might continue, he said.

One additional source of manpower in the future may be the millions who are entering the computing field through hobby computers, Ware suggested, although he expressed no great optimism over this possibility.

An underlying problem, he stressed, is that more personnel and better programming techniques address only a small part of the end-to-end cycle of software development.

The acutal programming is only the middle stage of a process that includes "a heavy front end" of intellectual work that must be done before programs can be written and a "back end" that includes debugging and testing.

Management must also consider the life-cycle support — mainteriance, documentation and "all those things you do to software after it is finished and delivered.

"It's not an art form. We shouldn't look at it as one and we shouldn't manage it as one," he said.

And we shouldn't look to new higher order languages (HOL) as a cure for all the ills of software development, Ware continued.

"Without a doubt, there will be new [HOLs] invented," but their impact will be modest. A 25-year investment in the existing languages, their documentation and programmer training ensures that the new languages will be ignored "unless they earn their way."

Unless some ingenious method of translating old languages into new is invented, the new HOLs will only be used for new applications.

Life-Cycle Support

Another mark of the next decade will be that the issue of life-cycle support "is really going to get into focus," he said. Management complains about the resources that life-cycle support consumes, but it is "the price we pay for change and improvement if we want change and improvement.

"We will belatedly realize we should design with life-cycle support in mind," he predicted. Management will learn how to manage it and the necessity to budget for it.

While we have learned some things in software development, such as the value of top-down design and structured programming, "we obviously have a lot more to learn and will have to learn or the life-cycle support will eat us alive," Ware said.

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What Happens to Afips' Revenues from NCC?

ARLINGTON, Va. — Thousands of DPers migrate every spring to the computer industry's "Big Event" — the National Computer Conference (NCC) — where packed technical sessions and jammed exhibit floors have sometimes spilled over into extra hotel space (NCC '79) or even into parking garages (NCC '78).

Although each year's NCC is months in the making, the show passes quickly and only the memories and the money remain. So what happens to the profits the huge exposition reaps for its sponsor, the American Federation of Information Processing Societies, Inc. (Afips)?

The answer is that, although NCC is a huge extravaganza, most of the profits are spent on the show itself or are put back into the computer societies, Afips said.

An examination of Afips' 1979 revenues shows that total revenues from conferences — of which NCC is by far the most substantial money-maker — amounted to $2,790,000, while conference expenses and obligations amounted to $2,204,000, according to Afips.

Besides the usual expenses of labor, rent and publicity, NCC expenses also include a charter financial obligation to the four principal member societies of Afips: the Association for Computing Machinery (ACM); the Data Processing Management Association (DPMA); the Institute of Electrical and Electronics Engineers (IEEE) and the Society for Computer Simulation (SCS). ACM, DPMA and IEEE each receive 15% of NCC profits, while SCS receives 5% and Afips itself receives 50%.

In 1979, Afips' total revenues from conferences, the Afips press, member dues and other income amounted to $2,981,000. Its total expenses for the year amounted to $2,856,000, which went toward conferences, publications, the History of Computing project, international activity, the Washington office center, public information, administration and projects and committees. The balance was put into a reserve fund.

Dive Unit Gauges Decompression

By Jay Woodruff
CW Staff

NORTHFIELD, Ill. — An inexpensive microprocessor-based system that provides divers with instant numeric readouts on all important dive parameters has been developed by Dacor Corp.

The Electronic Dive Computer weighs two pounds and is about two-thirds the size of a carton of cigarettes. Designed to be worn on the wrist, the unit operates at depths of up to 250 feet and is reportedly sensitive to changes of as little as one foot.

Power comes from a six-volt rechargeable battery. The dive computer replaces an underwater watch, a bottom timer, a depth meter and a water pressure gauge — items that usually cost more than the $435 that Dacor charges for its compact system, a spokesman indicated.

Decompression Guide

In addition to information on depth and time spent on dive, the unit provides the diver with a guide to decompression — rising slowly enough to avoid the "bends," a painful affliction where a too-rapid ascent from a deep dive causes nitrogen gas bubbles to form in the bloodstream.

The 10-function system is permanently programmed with decompression tables drawn up by the U.S. Navy. Any time a diver exceeds an ascent rate of 60 feet a minute, a light-emitting diode (LED) warning comes on.

Additional functions include an LED that lights when the diver must decompress (and remains on until decompression is complete) and a display that shows the maximum depth attained in a dive and at what depths the diver must stop to go through decompression, Dacor said.

To operate the Electronic Dive Computer, the diver merely turns the device on and begins the dive. A pressure transducer on one end of the unit measures the increasing pressure as the diver descends, converts it from an analog to a digital signal and stores it for calculations used to guide the diver through the necessary steps of ascent.

All calculations are performed automatically, and essential information is displayed on single-bulb LEDs. If more information is needed, a numeric display can be turned on to show time already spent on the dive, depth, time needed to decompress and at what level the diver must remain until decompression is complete, according to the system's designer William Bowden.

The product of six years of software and hardware development, the Electronic Dive Computer has been held up in production because of difficulties in making the custom-designed chips, Bowden said.

The chip maker so far has only been able to obtain a chip yield of 5 chips instead of the hoped-for 175.

Dacor has given the producer until January to iron out its problems before switching to another source.

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Don't Wait for Embassy Takeover

Fast Action Urged on Transborder Data Flows

By Connie Winkler
CW Staff

NEW YORK — Don't wait for someone to take over an embassy — address what is threatening the free flow of information now.

That was the advice of James D. Robinson, chairman of the American Express Co., at a recent session on transborder data flows here sponsored by the U.S. Council of the International Chamber of Commerce.

Threats to free data flow across national borders can be anything from a licensing requirement on data bases or a tax on satellite transmissions.

"It's not simply an American problem," Robinson said. "Restriction of the flow of data processing [industry] data affects all industries — therefore, you have allies all over the world."

'Call to Arms'

He urged corporations here to point out the impact of data flow restrictions to companies abroad. Those companies will have more influence on their own country's laws and governments, he said.

The session, with about 150 attendees, turned out to be a call to arms — to both corporations and the U.S. government — to organize action groups to ensure free information flow.

Not all the participants, however, were convinced of the dangers to transborder transactions. One suggested the issue was still being discussed on a philosophic level and that it wouldn't have any impact until presented in economic terms.

Two Approaches

Speaker Harry B. DeMaio, IBM's director of data security programs, described the two approaches to the data flow problem. The European model says knowledge is power, and if any one sector has a monopoly on that knowledge, it is necessary to protect the individual against it.

By example, DeMaio told of problems Readers' Digest encountered trying to get a subscribers data base in Sweden. The Swedish government, which has a data protection law, objected that the list provided too large a demographic picture of Swedish life.

Data protection comes through licensing or registration of data bases or through data transmission tariffs, based either on quantity or class of information transmitted.

The American approach centers around privacy and the post-Watergate control of government intervention into the lives of citizens, DeMaio explained.

To reconcile the two approaches, he suggested a more positive selling of the benefits to keeping an open flow of information across borders. This has to start at the company level, the IBMer said.

"Multinationals should translate their position to the countries where they operate, not just in the U.S.," DeMaio said.

Just Beginning

"This fight is just beginning," according to Stanley M. Swinton, vice-president and director of world services for the Associated Press. "As these doors come slamming down, you will find it harder and harder to find out what is going on around the world and to your representatives."

Swinton called attention to proposals coming from the United Nations and the United Nations Educational, Scientific and Cultural Organization (Unesco). He also suggested that the rhetoric to date on transborder data flows has been "the junk food of this whole debate."

What is happening with the transfer of data is what has happened with foreign governments' treatment of journalists, particularly Americans, he said.

John M. Eger, Washington, D.C., lawyer and former head of the White House Office of Telecommunications Policy, also urged quick action.

"In the rest of the world, they know that information is power and economic information is economic power," Eger said. Americans, however, have spent too much time talking about the problem of information flow and have lost sight of its importance to the world economy, Eger said.

Eger told of a Brazilian official who was taking copious notes at an international session on privacy legislation. When asked why, the official replied that he knew of no better scheme to regulate multinational company activity.

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Two Ways to Reduce Gobbledygook

Ruth Schiff Winett

"Where you go, I will go, and where you stay, I will stay. . . ."

"But in a larger sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground."

This is the eleventh in a series of articles on better writing.

Without formal schooling, the biblical Ruth and the almost mythical President intuitively knew the effectiveness of using parallel structure. Two methods of reducing the gobbledygook in technical writing are to use parallel structure and to use the active rather than the passive voice.

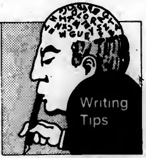
Parallel structure simply means that ideas which have similar meanings are cast in similar form: "I came, I saw, I conquered." Consequently, if words, phrases, or clauses are joined by conjunctions such as "and" or "but" or correlatives such as "both . . . and," "not only . . . but also," "either . . . or" and "first, second and third," they should be parallel in content and in structure.

Example 1: To write a program, testing the program and having completed the documentation — these were her goals.

Remedy A: Writing and testing the program and completing the documentation — these were her goals. (The revision contains a series of gerunds, or verbs plus "ing.")

Remedy B: To write the program, to test the program and to finish documentation — these were her goals. (This revision contains a series of infinitives. Whether or not "the program" is repeated before each item in the series is inconsequential.)

Example 2: During the meeting we will focus either on technical staffing requirements or on how to bill customers.



Remedy: During the meeting we will focus either on technical staffing requirements or on billing procedures.

Example 3: Not only the computer room but also the section where the offices are located has its own emergency generator.

Remedy: Not only the computer room but also the office area has its own emergency generator.

Use correlative expressions such as "not only . . . but also" and "either . . . or" with a comma only when the two halves of the sentence consist of clauses, not phrases — that is, if each of the halves has its own subject and verb.

Example 4: Not only does the computer room have an emergency generator, but it also has a separate emergency exit.

What is wrong with the following sentences? Why are they not parallel?

Example 5: On the agenda for the meeting were staffing requirements, billing procedures and standards for in-house memos.

Remedy: On the agenda for the meeting were staffing requirements, billing procedures and writing standards for in-house memos. (In the original only the first two items contain a participle and a plural noun.)

Example 6: Several suggestions were made: that he learn assembly language, that he improve his writing and that he come to work on time.

Remedy: We suggested that he learn assembly language and that he improve his writing. (Consider promptness in a second sentence since it is a different type of suggestion. The sentence is neither parallel in content nor in form. Note the omission of the passive "several suggestions were made.")

Active vs. Passive

In passive construction, the word which ordinarily comes after the verb (in the object position) appears instead in the subject position. Similarly, what is ordinarily the subject becomes the object of a preposition.

Since passive construction is less direct, writers should only use the passive when there is a compelling reason for stressing by whom or by what. Active voice is much more direct and to the point. Writers who use the active voice tend to achieve greater reader involvement in their articles.

Example 7: The program was run by the operator. (Passive)

Remedy: The operator ran the program. (Active)

Example 8: The door must be closed by staff members or the air conditioning won't work efficiently.

Remedy: Staff members should close the door so the air conditioner will work efficiently. (Notice how much more forceful active voice and positive form are than passive voice and negative form.)

Example 9: John's job is to be run before Sarah's job is run.

Remedy: Run John's job before running Sarah's job. (The imperative is more immediate and more direct than the passive in this sentence.)

Example 10: The job was run by the operator after the programmer fixed the bug.

Remedy: After the programmer fixed the bug, the operator ran the job.

Recently there have been several attempts to improve the quality of writing. For example, shortly after his election, President Carter declared that government writing should be shortened and clarified.

Admirable as his attempt was, the President was not wholly successful. The Postal Department, for instance, issued a document thousands of words long on how to mail a package!

Robert Gunning developed a method for identifying unclear writing in his book *The Technique of Clear Writing* (McGraw-Hill). To use Gunning's "fog index," writers must add the average sentence length to the percentage of hard words and multiply by .4. Gunning claims that readers may not be able to understand articles with a "fog index" greater than 12.

It seems, however, that it is far more profitable for writers to learn to identify and eliminate awkward and unclear constructions than for them to waste time applying mathematical formulas to sentences. Some of the constructions writers should learn to eliminate are dangling modifiers and passive constructions.

In addition, writers should become accustomed to using parallel structure to convey related ideas. An excellent reference book for matters of style is the recently revised classic by W. Strunk and E.B. White, *The Elements of Style* (New York: MacMillan, 1979).

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ANN ARBOR

Compared Against Personal Micros

Plato in Eye of Florida Education Controversy

By Jay Woodruff
CW Staff

TALLAHASSEE, Fla. — The State of Florida Department of Education may be headed toward a showdown on what kind of hardware and software it will use to improve the education of its children.

Lines are being drawn between Control Data Corp.'s Plato, a computer-aided instruction system that is now used in five of the state's high schools, and stand-alone offerings from Apple Computer, Inc., Hewlett-Packard Co. and others.

"Personal computers are the wave of the future not only in schools, but in the home," according to Dr. Alfred Bork, director of the Educational Technology Center at the University of California at Irvine. Bork is one of three consultants who were recently invited to aid a Florida study of alternative methods of instructional computing.

Bork criticized Plato as a "dinosaur," contending that it is too expensive, potentially less reliable and less capable than micros, especially in terms of graphics capabilities.

In addition, technology favors the personal computer because its volume production can lower the cost of educating a student, Bork said.

Extension Funded

Meanwhile, the Florida Legislature has allocated $792,000 to Florida State University to introduce Plato into four more schools, according to an account in the "Florida Educational Computing Project News," a newsletter for those interested in educational computing.

Bork disagreed with the action. He compared a large centrally based mainframe with remote terminals throughout state schools — Plato — with a microcomputer that services the needs of one school.

Communications-bound systems such as Plato are in trouble because the Bell System is gradually replacing its monthly charge for local calls with per-time-unit charges that will increase the cost of local networking arrangements, Bork noted. A Michigan educational networking system was "wiped out" by per-unit charges when they were instituted in that state, he said.

Concerning reliability, Bork maintained that a CPU connected to 1,000 terminals will affect more users if it goes down than will a smaller system connected to 40 users.

Further, personal computers can offer greater graphics performance, largely because they are not dependent on the speed of transmission from the central-site computers for animation. "You can do nice animation on Apple computers using Pascal. Stand-alone CPUs are so cheap that makers can design separate CPUs to handle graphics," he continued.

However, Dr. Jess Poore, director of the Florida State Computing Center and a proponent of Plato, disagrees on the questions of cost, capabilities and Plato's relative performance compared with smaller computing systems.

For one thing, cost should be measured not by cost per student, but "cost per educational event" — the time it takes to complete a teaching task, Poore said.

"I can at least say that during a one-year study in three schools, it cost about $150 to raise a student from grade 5.8 to grade 8. The students were 11th and 12th graders who might not have learned otherwise," he said, referring to a remedial course offered on Plato. The director did not think the $150 cost was expensive.

Plato is the only system that offers such an extensive and coordinated curriculum of coursework for students, he added. For "hard-core educational problems," Plato is alone in the field, he said.

For instance, it offers a 400-hour package designed to prepare students for high school equivalency tests, and "nobody else has it.

"In the future, when a couple of hundred hours of coordinated curriculum are available on a small system like an Apple, then we can talk about comparisons," he said.

'It's Not a Contest'

What type of system can best educate a student? Poore indicated that until something better comes along, the Plato method works best for the learning problems the Florida educators are trying to solve.

"We have scores of micros here. It's not a contest. It's using appropriate technology for the problem at hand," he maintained.

Poore said Plato is a "live and evolving system" whose terminals use the same high-performance chips found in most of the micros to which it is compared. Other than color graphics, which are under development, Plato users can perform approximately the same graphics work as the other available systems.

High transmission speeds are not needed to produce complex graphics such as animation because once the application is downloaded to the micro in a remote terminal, the mainframe does not have to transmit every part of the movement in order to produce the animation, Poore said.

But when one is talking about basic educational needs, graphics performance is not of great importance: "Animation is only of marginal value when teaching arithmetic," Poore remarked.

Regardless of present cost, the main thing is to realize that until a better developed program appears on the horizon, the Plato system has been helpful and stands alone among the micro systems with which it has been compared, the director said.

Review Manual for CDP Exam Carries $7.50 Charge — For Some

CHICAGO — For instructors with intentions of developing review courses for the Certificate in Data Processing (CDP) examination, help is offered for nothing. For novice DPers planning on taking the exam, that same help will cost $7.50.

That's how the Institute for Certification of Computer Professionals (ICCP) decided to market its latest study guide for the CDP exam.

Called the "Official CDP Instruction Manual," the manual was specifically designed for instructors developing review courses for the test. The ICCP therefore decided it would be in everyone's best interest to offer the manual free to instructors, a spokesman explained.

However, to offset the cost of doing that, the ICCP also decided to put a $7.50 charge on the manual for candidates who want to do their own boning up for the test.

Prepared by five members of the CDP Certification Council — which prepares the tests — the manual defines the scope of the CDP exam and defines subject areas by importance on the test, ICCP said.

The next CDP exam is scheduled May 3 at more than 100 sites in the U.S. and Canada. Registration for the test closes March 1.

The manual, which will be updated every two years, is available from ICCP at 35 E. Wacker Drive, Chicago, Ill. 60601. It will be shipped via fourth class mail and should be delivered about a week after the order is received.

Call for Papers

ASSOCIATION FOR COMPUTING MACHINERY 1980 ANNUAL CONFERENCE, Nashville, Tenn., Oct. 27-29.

"Previewing the Computer Age" is the theme of the conference, which will focus on computer technology, products and services that will have an impact on the 1980s.

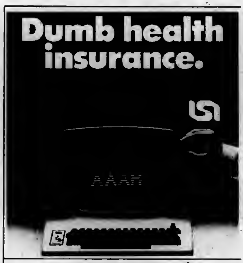
Theoretical, state-of-the-art reports, reviews or tutorials are invited on any aspect of computer research, development or application. Papers submitted must not have been previously published or presented, should not exceed 15 typewritten pages and should include an abstract and bibliography.

Five copies should be sent by Feb. 18 to Dr. Gordon Sherman, Technical Program Chairman, ACM '80, University of Tennessee Computer Center, Knoxville, Tenn. 37916.

FIRST ANNUAL CONFERENCE OF THE NATIONAL COMPUTER GRAPHICS ASSOCIATION, INC., Arlington, Va., June 16-19.

Subjects to be covered include new developments in applications of computer graphics; hardware and software in such fields as management, information systems, computer-aided design, engineering and scientific research.

Information on requirements for participating or submitting papers is available from the National Computer Graphics Association, Inc., Suite 512, 1129 20 St., N.W., Washington, D.C. 20036.



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EDITORIAL

Needless Confusion

The worst fears about software incompatibility with the new DOS/VSE operating system announced by IBM with the 4300 series of processors apparently will not come true — at least not now.

While most vendors of applications and utilities have reported few problems converting to DOS/VSE operation, the news from the more complicated data base management systems (DBMS) front was not in until last week — and the news was good for users.

All vendors of such systems reported that their products would work in the IBM 4300 environment [CW, Dec. 3] DBMS are complicated and complex; if they can run under DOS/VSE, it is likely that most user-written code will also run with the new IBM computers.

It's too bad, however, that the industry had to wait almost 10 months to be sure that products designed to run on IBM equipment would in fact run on the newest of the IBM product line. This delay — until enough systems were installed to test the independent products — caused confusion in both the industry and in the computer-using community.

IBM could overcome this problem by providing independent vendors with earlier information on its new software systems and by providing technical details of the new systems when they are announced. In addition, it could set up a testing service with some of its early machines so that independent vendors could check out their products on the new equipment and under the new operating systems.

Unfortunately, however, IBM does not do any of these things, which would make life easier for both the independents and the user community. It apparently sees some benefit in the confusion it causes every time it announces a new computer with new operating systems software.

Up and Operating

Well, CW Communications, Inc.'s move into new facilities in Framingham, Mass., has been completed. After a hectic weekend, everything is in place and *Computerworld* is up and operating.

However, as with any undertaking of this sort, there are some problems. If you have run into any delays trying to reach us, please bear with us.

By the time you read this, everything should be operating well, but we are apologizing in advance for any problems you may have had last week.

Our new address is 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701. The new phone number is (617) 879-0700, and the new Telex number is 95-1153 COMPUTWRLD FMH.

DATA PAST

Five Years Ago
Dec. 11, 1974

HUDSON, Mass. — The Society of Certified Data Processors (SCDP) proposed legislation that would regulate the data processing profession. The legislation would set up state boards of registration to rule on who could "practice data processing" or call themselves "data processors" or "computer professionals."

— — —

WASHINGTON, D.C. — The General Accounting Office began investigating allegations that members of the oil and gas industry could access confidential regulatory information through an on-line computer system that would soon be operational at the Federal Power Commission. The contract for the $10 million system was awarded in July to Planning Research Corp., a company whose subsidiary, Foster Associates, represented petroleum interests in Washington.

Eight Years Ago
Dec. 8, 1971

WASHINGTON, D.C. — Computers are "the key U.S. contribution" to South African apartheid, according to The American Committee on Africa, which said a computer system would be used to compile dossiers on all blacks in South Africa.

'This is your controller speaking. Please hold current coordinates until the computer comes back up . . .'

LETTERS

Laws of the Land

The American judicial system is not as parochial as the article entitled "Lawyer Involvement in System Design Defended" implied [CW, Nov. 26]. Quoting (misquoting?) an official of the American Bar Association, the article said that "no state will enforce a law of another state . . . ."

As a practicing lawyer, I can tell you that this simply isn't so. In interstate business transactions, a court in one state will routinely apply the law of another state of the U.S. under well-recognized principles governing conflicts of laws.

The article's focus was on drafting contracts. A well-drawn contract often contains a choice of law claose, which specifies the state whose law is to be applied in construing the agreement. The parties' choice of law expressed in a contract is generally followed by the courts, provided that the state chosen has some reasonable connection with the transaction.

Kenneth P. Carroll

New York, N.Y.

Poor Choice of Models

The article "Towards Software Engineering" by Gopal Kapur [CW, Nov. 12] was correct in its attempt to state that structure values come mainly from the use of precoded models. I feel it unfortunate that the choice of models leaves something to be desired.

While a sequential model would have been an asset five years ago, it is out of place today. We are trying to forget the horrible sequential syndrome. We do nut appreciate having it raised to a place uf importance.

My personal opinion is that three structured models can handle everything. They are Edit and Update, Extract and Report. I feel you cannot separate Edit from Update, as validity is not final until you compare the data to an existing file. I would relish the chance to present an updated version of the concepts presented in this article.

A. Vasek

Grand Rapids, Mich.

'Become' With It?

Terence Hughes almost wrote a very good letter concerning poor use of words [CW, Nov. 19].

I do agree with him, by stretching his argument a bit, that the Italians would probably not like to have their ancestors called Ropersons.

However, he ruined the effectiveness of the letter by ending it with "Get wise, girls."

No one can "get" wise. Become wise, Terence.

Dave Witthans

San Jose, Calif.

To The Rescue

I would like to communicate with individuals or companies that have converted from the IBM 360/20 disk and card system to an IBM System/34. I can be reached through my office at P.O. Box 5365, Beaumont, Texas 77702.

We'd prefer someone in a manufacturing environment, but would be glad to hear from anyone. Help!

Harold Core

John Dollinger Jr., Inc.
Beaumont, Texas

***Computerworld* welcomes comments from its readers. Preference will be given to typed, double-spaced letters of 150 words or less. Letters should be addressed to Editor, Computerworld, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.**

READER COMMENTARY/Gregory Enholm and Theodore Rueter

Cards Better Than Coupons for Gas Rationing

Now that Congress has granted the President standby gasoline rationing authority, the mechanics of a possible rationing plan must be discussed. As of yet, public debate has assumed that the coupon-based rationing of World War II will be reintroduced. If the nation is to avoid a system that involves "44 million new booklets and 44,000 additional bureaucrats," as Sylvia Porter wrote in a recent column, alternatives to coupon rationing must be considered.

We propose to utilize advances in computer technology: Rationing could be accomplished by issuing each driver a credit-card-size gasoline rationing card readable by devices provided to gasoline stations. Two variants of this proposed card system are already in use: after-hours bank teller machines and the Washington, D.C., area subway fare card system.

Card-based rationing would provide advantages with respect to administrative efficiency, lessened fraud, moderation of gasoline prices and energy conservation.

Is Rationing Necessary?

The disappearance of gasoline lines has convinced many that rationing is a dead issue. This is myopic; President Carter's oil import quotas and the prospect of continuing tight supplies necessitate standby rationing. So, too, do the other possible causes of an oil supply shortfall.

In the June 4 issue of *The New York Times Magazine*, Harvard lecturer Daniel Yergin wrote: "There could be a natural disaster. Or an accident or a terrorist strike in the oil fields or in the narrow straits leading to the Persian Gulf. Or the growth of the Soviet presence in the region, some new twist in the Arab-Israeli conflict or a struggle for preeminence among Saudi Arabia, Iraq and Iran. Or a shift in the outlook of the elite that runs the Saudi Kingdom. Or — and this is the very real danger that Western officials prefer to close their eyes to — a coup in Riyadh and the accession to power of a radical like Libya's Colonel Quadafi."

Recent events in Iran and Libya have demonstrated the types of problems that can arise.

The alternative to direct rationing is rationing by inconvenience or price. Rationing by inconvenience has no political appeal and equally little intrinsic merit. Rationing by price discriminates against the poor; leaves prices to the discretion of the Organization of Petroleum Exporting Countries and the oil companies and is based on the faulty assumption that demand for gasoline is elastic.

Sylvia Porter proposed rationing by

(Continued on Page 26)

HUMAN CONNECTION/Jack Stone

What Makes Programmers Run?

Motivation of DP personnel is a matter of increasing interest within the academic community. You may have noticed results from new research on the subject that appeared recently in the trade literature.

I want to report two events that occurred late in October. The first took place at the annual meeting of the Association for Computing Machinery (ACM) and the second at the annual meeting of the Association of Computer Programmers and Analysts (Acpa).

At ACM, I was privileged to be a member of Roy Cottrell's panel which gave verbal reports on progress in computer personnel productivity research. I was particularly impressed by one of the participants who sought to build the ultimate taxonomy of factors influencing programmer motivation. He showed charts of what seemed like 50 or so of these factors, which fell into psychological, sociological, organizational, personal, educational and other realms.

All of this was overwhelmingly impressive, until he made the observation, "Of course, these parameters generally interact with one another and, therefore, it's very difficult to isolate any particular one for the purposes of scientific measurement." Well, I'm a strong proponent of such research as long as I don't have to spend *my* career at it.

I have a far greater interest in not waiting until the research data is all in, but moving ahead and addressing — or, better said, seeing others address — the pragmatic motivational problems of the computer center using common sense . . . . Which leads to the Acpa meeting.

I was one of the Acpa luncheon speakers and gave a talk on the need for improved human communications to enhance managerial and systems successes in the industry. I conducted a nonscientific survey — using the nonstructured show-of-hands gambit (a methodology which, for a change, costs no time or money). The audience, a group of about 70, was about one-third DP managers/supervisors and two-thirds technical personnel.

Different Response

My questions dealt with their perceptions of how they viewed others (users, management and so forth) and how they thought others viewed them. Except for one question, an overall conclusion was that about 30% of the attendees had positive external relationships and the balance were negative.

The one question that evoked a radically different response went something like, "Do you feel your top management is supportive and understanding of the data processing activity? Put another way, are you happy with your management?" A grand total of one person answered "yes."

I happened to run into this fellow after the meeting and asked him why he answered as he did. His response was a pragmatic set of guidelines which seemed to be as good as any I've seen for motivating a systems department without dedicating half the center's resource to the task. I have capsulized them below:

- A short- and long-range forecast in job opoportunities is made available to all employees, so they know for what jobs they can compete.
- Everybody is evaluated using easy-to-understand, standardized criteria. There is heavy input from the employees. The evaluations are discussed among all the managers so that general agreement is obtained on the relative performance of all members of the staff. Then prospective candidates are matched against future positions.
- Before the positions open up and where practical, the company tries to assign candidates to future managers for preliminary evaluation. Both people involved get a good chance at sizing up the other and deciding whether the matchup will succeed.

Of course, these thoughts do not constitute a dramatic new find in the sociopsychological environment. But they suggest that employees can be motivated when they believe they are being dealt with in an even-handed way, that they have the opportunity to make a contribution to the best of their abilities; that they have a strong voice in attesting to their performance; that exemplary performance will not go unrewarded; that there is a master plan for personnel growth; and that there is a joint evaluation of a new manager and a new position before the person is reassigned.

And, if you will allow me to draw on some further testimony from outside the industry as to the validity of these statements, this same philosophy has been implemented to the letter by one Jack Pardee and the strategy has made him a candidate for National Football League coach of the year.Go Redskins!

Comments or questions pertinent to the human side of data processing should be addressed to Stone at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

READER COMMENTARY Daniel J. Sabieski

DP Exports to Soviets: A Dangerous Proposition

Bohdan O. Szuprowicz wrote that the arguments of those who oppose the export of computers and other high-technology products on the grounds that they will be diverted to military uses "are laughable in the face of reality" [CW, Sept. 17].

He argued that the Soviets already have the means to kill us several times over, so that additional technology would not enhance the danger. He also stated that, in any event, the Soviet bloc is manufacturing its own quality equipment so all we would succeed in doing would be to lose a potentially lucrative market.

The fact is that Soviet computers are not being produced in either great quantity or quality and that American computers purchased by Moscow are in fact being put to military uses. Soviet dissident Anatoly Sharansky says he worked with American computers while in the Soviet military.

M. Glushkov, director of cybernetics at the Soviet Academy of Science, has written in *Izvestia*: "The best computers made in the Soviet Union operate only a few hundred hours between failures, while ancillary devices break down practically daily, and the information stored on tape cannot be stored without some loss for more than a month."

Soviet physicist Andrei Sakharov has commented: "The second industrial [computer] revolution began, and now in the 1970s we can see that rather than catching up with America we are falling farther behind . . . . The gap between the two is so wide it is impossible to measure it. We simply live in another epoch."

Overkill, too, is a meaningless statistic. It could be argued that we have enough rifle ammunition on hand to kill the Soviets a dozen times — on paper. Doing it is another matter.

Overkill assumes your weapons will work, that the enemy will mount no defense, will take no measures to protect its population and industry and will not strike back with its own weapons. Clearly, this is not the case.

The Soviets are obviously not aware of their ability, since they are building more weapons at an unprecedented rate. Or perhaps they realize that technology does not atand still, that seemingly invincible offensive abilities are quite quickly and quite inevitably nullified by defensive technologies. Those nations who revel in their overconfidence soon suffer the indignity of a Pearl Harbor.

Lagging Behind

In point of fact, the best Soviet-made computers are believed to lag at least three years behind widely available American counterparts in processing speed, eight years in memory capacity and a decade in peripheral apparatus as well as a decade behind in software.

To the qualify gap must be added the quantity lag. There are only 25,000 computers in the Soviet Union, two-thirds of which are used for military purposes. The U.S. employs more than 300,000 computers, one-quarter in military applications.

The principal reason why the Soviets are so far behind in computer technol-

(Continued on Page 26)

THE TAYLOR REPORT **Alan Taylor**

Honeywell Should Provide Answers — Not 'Policy'

The successful Honeywell, Inc. Level 6 has had its production cut. As a result, the corporation has broken the delivery schedules it published to guide prospects and get orders. The corporate failure seems to have started about October and hopefully will last only until next March.

The reason for the broken promises is that Honeywell had not obtained its integrated circuits and, as a result of shortages in the market, will not get them in respectable quantities until next year.

In dealing with the problem, Honeywell spokesmen have resorted to Madison Avenue techniques of indirectness, simply referring to "mistakes" and using IBM as a potential scapegoat. In fact, IBM is serving the tarnished Honeywell image in two capacities — by being the setter of the industry standard of irresponsibility for broken delivery promises and also by being the rumored buyer of massive quantities of integrated circuits.

IBM's purchases, the theory goes, have been the cause of Honeywell's inability to get integrated circuits it knew it needed to make promised deliveries.

Honeywell's official position on the Level 6 varies in its explanations. The first explanation for the situation is the system's success. Circuit shortages are not mentioned here, and longer, but not broken, schedules are involved. On being challenged, the company describes the situation as a mistake, and the circuit shortage is acknowledged as having caused production to drop, although it is planned to increase.

Shelter From Responding

"Policy" is used to shelter the corporation from having to respond and identify just how bad the production drop is. (Rumor puts it as being more than 75% to 80%.)

Users are left with the clear impression that not only does Honeywell make promises without ordering the needed parts, but also that it is concealing the facts as a matter of policy.

From this comes the question as to how users can rely upon Honeywell's claim that the only delays are for those Level 6s scheduled for delivery in the fourth quarter of 1979, which are being delayed until the first quarter of 1980.

Industry Standard Problem

The real problem arises because, as Honeywell brings out, industry contracting standards permit delivery promises to be broken (see box). What is not so traditional, however, is the use of policy to cover the situation after such promises are known to have been generally broken. Honeywell, being a public company, has to report anything material to the Securities and Exchange Commission, and while the fourth-quarter profits of the entire corporation may not be impacted, the serious reduction of the Level 6 production lines certainly has an impact on the business line concerned.

Shortages in electronics seem to be growing, but also seem to be controllable by forward-looking corporations. Honeywell has failed to provide some tangible, written information that both reassures disappointed customers that the next promise will be kept and that money is available and being used to order components in time to safeguard promised production.

This approach hurts the entire industry. It suggests that the sellers of information regard information as a propaganda weapon to be used to provide 1984-style misinformation.

The trusting users deserve better information than this.

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Check Your Delivery Rights

The rights of a user to get delivery as promised by the salesman, or by the corporation itself, are limited by the contract — notwithstanding any proposal or written or oral promise outside the contract.

Typically, computer contracts *do not* contain any delivery promises themselves and often directly withdraw and disown the delivery schedules and promises that have been separately provided.

To check your agreement, quickly look for these two clauses:

- **Entirety of the Agreement.** This is normally a short clause on the last or next-to-last page of the master contract. It simply says that nothing outside the agreement matters. Sometimes it specifically goes on to disown other communications, letters, proposals and so forth.
- **Delivery date.** This is probably not there or is only a statement that the equipment is "scheduled" for delivery on such a date.

If you have an "entirety of the agreement" clause and don't have a clear delivery date promised in the agreement, then call your lawyers if you want to be protected.

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READER COMMENTARY/Michele Landon

Software Putting Programmers Out of Business

In an industry where hardware becomes outmoded before it is installed and software is phased out before it is even debugged, have programmers become obsolete before the first generation has settled into retirement?

Anyone who reads the classified ads may doubt my sanity for raising this question. Companies are begging for programmers; some are even paying bounties to employees for bringing in a programmer.

This ideal supply and demand situation is, alas, not destined to continue, and it is the industry itself which will end it. In an effort to meet the growing demand for programmers, we will create software that will unfortunately but unavoidably eliminate programmers.

Take for example, IBM's Development Management System (DMS), a software package that runs under CICS and whose purpose is to produce quick on-line systems. The basic premise of DMS is that most on-line systems involve either resource assignment or file building and maintenance.

A further breakdown of file functions are ADDs, INQUIRIEs, UPDATEs, DELETEs and BROWSEs. These functions, of course, apply to any files whether Master, History, Validation or Open (for transaction).

Furthermore, the problem of resource assignment is really a matter of file correlation – a match of an open problem file with a personnel file, for example. So much for the systems analyst/designer.

Now for programmers and coders. The next premise is that most on-line application programs involve several basic functions: File Control, Display Control, Message Control, Hierarchy Management, Data Manipulation, Communication Field Management and Error Panels. DMS provides the building blocks to do most of these functions now; those which are lacking will be included in later releases.

Special panel forms are supplied. The programmer fills out the form, translates it to cards and runs the cards through a DMS assembler, which basically generates the on-line program.

The ultimate aim is to make the process so easy that users can write their own programs. Now, the argument might be made that users won't want to code forms. But have faith – in future releases, the coding will be done interactively.

So, in fact, users will be code-freeing the programmer for more important tasks – such as waiting in unemployment lines, or maybe training for a new trade!

These types of products are much more of a threat to programmers than the stylized programs that were around previously. First of all, DMS is not performing one precise function; it is for generalized coding. Secondly, it will be done interactively, which makes it convenient for users.

But third and most important, it is breaking down design and coding principles to basics and stripping us of our "mystique." No longer will we be able to listen to users' requirements and tell them that x man-months and y dollars later we will somehow magically produce their system. The user group may very well decide to design and code the system itself.

So goes our powerful centralized DP departments. So goes the programmers and analysts, the DP schools and, last but not least, our DP recruiters.

Will we go down in history as the profession that created and destroyed itself in 25 years? Or is there hope that we can somehow – with our logical, orderly, well-programmed minds – create a logical child to the data processing profession?

Landon is technical supervisor of the Hartford (Conn.) Group.

READER COMMENTARY/Robert Shullich

Where Is Your Garbage Tonight?

Today companies pay thousands of dollars to protect their data. This protection ranges from the lock on the computer room door to sophisticated data encrypters. A good data encrypter package could go for as much as $40,000.

What good does all this security do if input and output are not protected? Yes, even the input to a computer run can contain enough information to put a company out of business.

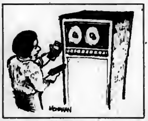
The DP field disposes of computer printouts and cards in many ways. The most common ways are incineration, recycling and regular trash disposal.

Many companies are becoming ecology-minded and are recycling computer waste. But many of these companies have failed to ask, "Is my garbage safe after it leaves?"

For those who are willing to chance sending critical data to the recycling center, here is a story of what happened to me when I worked for a university on the East Coast.

The most confidential information that a college keeps is student records. These records include student grades and other specific information that cannot be released without the student's permission. Unauthorized release of such information could subject the college to a lawsuit for privacy viulations.

At the end of every semester, a package of cards was sent to each professor. There was one card for each student with the student's name punched into the card. The professor marked the final grade on the card, which would later be optically read and punched into the card through an off-line process. The cards would then be read into the computer and updated against the transcript master file.



'One More Mistake and Your Little Friend Here Gets It.'

When the time came one month to get rid of 60,000 punch cards, the college followed its procedure to recycle all cards and printouts. Every month someone arrived in a pickup truck to transport all the computer waste to the recycling center.

We loaded all the student record cards, in addition to 30 cases of other cards we used during that particular month. About an hour after the pickup truck left, however, we got a call.

A lady that lived along the pickup truck's route called to report that her whole front lawn was covered with cards that had "FINAL GRADE" written on them. It was later discovered that the pickup had hit a pothole and the load had not been tied down properly. On this lady's lawn were 11,000 potential lawsuits.

We were lucky – no one found out. The inside joke of the semester was, "If a student wants his final grades this term, let him look in the street."

An accident like this could put a business in serious trouble if the wrong listing got into the wrong hands. Something as innocent as a core dump could be a data center's disaster. An I/O buffer showing transaction formats and passwords to user-supplied security algorithms could be easily extracted and decoded by a systems programmer.

So when an old listing becomes obsolete and is thrown out, think of whether the report is obsolete for someone who can use it against you. That listing you threw out, the one you didn't shred or burn, where is it today?

Shullich is a computer consultant employed by Informatics, Inc.

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LETTERS

Marking End of File

I have read with interest the various ways in which several authors have applied the structured methodology to the file/transaction processing task using the Cobol language. Anthony F. Vignone's model in the Nov. 26 issue was the best yet and certainly points out the goals of structured design.

What all of the writers have overlooked in concentrating on the lower level sections or on the issue of the "priming" READ, is the ambiguous use of a high-valued key value to mark end of file.

Reading the statement (from Vignone's model) "PERFORM SELECT-SALES-RECORD UNTIL TRANS-KEY EQUAL HIGH-VALUES," one is led to wonder if there are high-valued keys used to mark the end of or divisions in the input file. The PERFORM statement as written does not tell the reader that an end-of-file condition is the real criterion for termination.

The program will ignore input if a high-valued key appears in the input data stream. Because the data item TRANS-KEY is referred to after end of file, it must be located in the WORKING-STORAGE SECTION, necessitating an extra move of the record from the input area into WORKING-STORAGE SECTION for each input record.

The use of 88-level entry end of file flag data item increases readability and prevents a program error if a high-valued key is encountered in the data.

My suggested solution follows:

```
WORKING-STORAGE SECTION
01 END-OF-TRANS-FLAG PIC X(3).
  88 END-OF-FILE-TRANS VALUE 'END'.
. . .
REFORMAT-THE-TRANS.
  OPEN INPUT TRANS-FILE.
  MOVE SPACES TO END-OF-TRANS-
   FLAG.
  PERFORM READ-TRANS.
  PERFORM SELECT-SALES-RECORD UN-
   TIL END-OF-FILE-TRANS.
  CLOSE TRANS-FILE.
SELECT-SALES-RECORD.
  IF SALES-RECORD
    MOVE TRANS-KEY TO SORT-KEY
    MOVE TRANS-DATA TO SORT-DATA
    RELEASE SORT-RECORD.
  PERFORM READ-TRANS.
READ-TRANS.
  READ TRANS-FILE
    AT END MOVE 'END'. TO END-OF-
TRANS-FLAG.
```

Kevin W. Davidson
Greenville, S.C.

Insults to Professions

Were the Reader Commentary articles in the Nov. 26 issue planted there to insult and outrage members of my profession or are Anthony Vignone, Edward Talbot and Chris Rohrs living proof of the ignorance and ineptitude prevalent in today's data processing environment? If the latter is true, I can see why members of the non-DP community feel like victims.

Allen B. Savin Jr.
Phoenix, Ariz.

Pitfall With GOTOs

In reference to James L. Gillaspy's letter [CW, Nov. 19] referencing Bruce Sherman's commentary on Cobol GOTOs [CW, Nov. 5], Sherman's code in Figure 3 will work in any "GOTO-less" program since the only path to "REFORMAT-THE-TRANS" is via a PERFORM.

This example illustrates a major advantage of "GOTO-less" code: elimination of the "accidental fall thru." This is a frequently encountered error in programs that are permitted to include the GOTO statement.

Steve Ryder
Austin, Texas

Too Kind to Code

Pacifico A. Lim [CW, Oct. 1] was too kind to GOTO-less Cobol programming in calling it "unrealistic and rather romantic." A program of any size that uses the PERFORM verb instead of GOTO to implement selection and iteration will contain a proliferation of performed paragraphs and sequences of paragraphs which are artificially displaced from their logical locations in the program.

Such a program will clearly be structured but not much else about it will be clear, and it will resist maintenance, especially by someone other than the author. Bruce Sherman's examples [CW, Nov. 5] are instructive in showing what can be done in Cobol, but this is not what needs to be done to real programs.

The only desirable uses of the PERFORM verb are to avoid duplication of code and to execute overlay sections. If a program has no overlays, it should have no unique PERFORM statements, that is, each performed sequence should have at least two references. Within the mainline code and each performed sequence, GOTOs can and should be used to create the needed structures.

Lim warned that a GOTO should be avoided "if its use will compromise the readability of the program." The readability of a Cobol program which is oriented to GOTOs instead of PERFORMs can be assured by allowing backward branches only to labels that end with "-LOOP" and forward branches only to labels without this suffix.

Garth Peterson
Sioux Falls, S.D.

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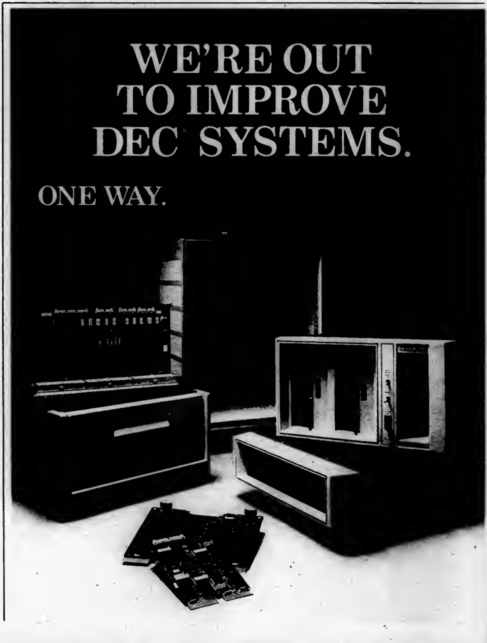

READER COMMENTARY/Robert A. Germinsky

The Forgotten Factor in Converting to DP

When I was assigned the task of moving our company from a manual to a DP system, I was very pleased. It seemed like a fairly routine task, one that could be accomplished with few problems.

I set to work making up schedules and programs, then began to meet with each of our employees individually to explain their roles in the system. They listened politely and asked few questions; I got the impression that I was a great teacher.

As things progressed and we tried to rely more and more on the system, there was a complete breakdown in the work flow. Inaccurately filled out papers, lack of cooperation and wrong data brought the system to a complete halt.

I held more meetings and again explained what I expected. When I was asked why something had to be done a certain way, I made the mistake of saying, "That's the way the system was designed."

The situation worsened to the point that no billing was being done, but the office staff didn't seem concerned. They thought that as soon as the system was fully on-line, most of them would be out of a job.

Morale was very bad. I had lost control of the situation.

This state of affairs had me worried. I understood the system and saw all of its advantages. Why couldn't anyone else?

Our company is an electrical contracting firm that has been in business since 1922. It was and still is a fairly close-knit organization. Prior to the DP system, people relied on others for help in accomplishing tasks. There wasn't anyone who couldn't do another person's job if the need arose.

With the advent of the computer, this changed. My original course of instruction forced these people to operate on what could be called a "need to know" basis. This was fundamentally wrong. Anyone who works within an organization must feel that he is playing a vital role in the functioning of that organization.

Educational Campaign

Then it occurred to me that nobody really saw the system as a whole; they only saw their piece of it. When I realized this, the solution to the problem began to take shape.

I started an educational campaign. Going back to the basics of how the computer worked, I explained the entire system first to our line supervisors. I explained to them how a mistake on their part would affect the system downstream. I told them how they fit into the overall operation of the system, not just their part in it.

To our office staff, I explained and emphasized that the computer would not eliminate jobs, but would create them. We needed people to operate the system, interpret the results of reports and to maintain our bookkeeping and accounting files.

The problem was not with our system, or with our personnel, but with me. I had been so immersed in the nuts and bolts of getting this computer on-line that I overlooked the people we would need to make it work.

I found that our people were interested in the computer, what it would do and how it would do it; they were anxious to help. The problem was that they didn't know how, and I had neglected to fully explain to them how they could help.

After my reeducation campaign, the results were quite remarkable. The system operation picked up, morale rose and things began to work the way we had planned when the system was originally designed back in 1976.

We still have problems from the usual bugs that are encountered in the software or hardware. These are being worked out between our staff and the people who sold us the system.

The most important bug, however was worked out within the company — the function of our people within the DP framework.

Germinsky is a DP consultant in Plainfield, N.J.

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Card-Based System Best for Gas Rationing

(Continued from Page 19)

minimum purchase requirements and the use of driver's licenses: "Your license could be punched each time you got gas. If purchases were permitted twice a week and rationing had been in effect for two months, you could buy gas only if your license had been punched in the spaces showing 16 purchases or less. This would enable you to 'save' your allocations, saving gas, too."

Our proposal is similar but more extensive. The first step would be to seek bids from computer firms to develop the card readers, gasoline rationing cards and necessary computer programs. A list of drivers and their addresses could be compiled from oil company charge account records. The government must also take applications to ensure that all drivers receive a rationing card.

After testing the system to identify and correct problems, card readers would be manufactured and shipped to all gasoline stations. Gasoline rationing cards would also be mailed. A period of voluntary cooperation would phase in the system; presenting a rationing card would become mandatory once everyone had received one.

The process at the station would be similar to charge sales. The driver or attendant would insert the electronically encoded card into a card reader to display the individual's remaining ration. The driver or attendant would them pump up to this amount.

The kind and amount of gasoline sold and its price would be encoded onto the card by punching a keyboard on the card reader. If the card readers were not functioning, a form would be used to record the sale. Gasoline deliveries would be recorded to make certain gasoline stations were enforcing the rationing system. Failure to record a gasoline sale would be a federal offense punishable by a large fine.

All transactions made on a card reader would be recorded on removable cassettes. At regular intervals, replacement cassettes would be mailed to all stations. The cassettes would be mailed back to the government for compilation of gasoline usage data.

An administrative apparatus would be needed to handle requests for ration alterations. Persons requesting a reduction in their ration would receive a cash bonus along with their new card. The bonus would be generated from charges made to individuals requesting a larger ration.

In addition, under a tax incentive plan, the 1040 form could be modified to include a gasoline use credit. Low consumption would be rewarded with a tax rebate inversely related to income.

Such a card-based rationing system has numerous advantages:

Administrative efficiency. This system would actually be a "standby" gasoline rationing system. In the event of an oil supply interruption, the card system could be reinstituted immediately. A coupon rationing system would require a massive effort to redistribute coupons.

- Most of the rationing "work" would be done by computer, thus reducing the need for a large bureaucracy.
- Only one nationwide distribution of cards is required, instead of the continual distribution required with coupons.
- Coupons would be expensive. The nation's 165,000 gasoline stations pump an average of 50,000 gallons each per month. If gallon coupons cost one cent each to produce, the cost would be $82 million per month, or nearly $1 billion a year – not including the cost of distribution and collection.
- Card rationing allows the federal government to more precisely monitor gasoline allocation and usage.
- Allocation can be based on actual consumption. Data collected after the initial allocation may be adjusted on the basis of exact information.

Lessened fraud. Gasoline stations would be required to enforce the system. Stations might easily circumvent a coupon rationing system.

Moderation of gasoline prices. Rationing would limit demand, thereby creating less pressure on prices. In addition, the ability to electronically monitor prices would stem price gouging.

Energy conservation. The use of a tax credit is a direct incentive to reduce consumption. Such a system would not be possible without the consumption information afforded by the use of computers. As another conservation factor, distributing cards on the basis of drivers' licenses instead of automobile ownership eliminates the incentive to purchase automobiles.

The prospect of future gasoline shortages necessitates a plan for effective rationing. The imperatives of justice, equity and national security demand such action.

Enholm and Rueter are graduate students at the University of Wisconsin in the departments of economics and political science, respectively.

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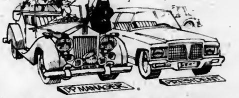

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Soviets Making Military Use of U.S. DP Gear

(Continued from Page 19)

ogy, experts believe, is their failure to master "chip" technology, the ability to place large numbers of miniature components on tiny silicon chips about half a square inch in size. American engineering can put up to 50,000 components on a chip, while the Soviets can barely manage 2,000.

Moscow has been trying to overcome this technological backwardness by buying and stealing Western technology. In 1972, with U.S. approval, France agreed to build an integrated circuit plant in Poland. In a related deal, a U.S. firm contracted with another Soviet bloc country to develop a turnkey production line of integrated circuits for hand calculators. Included in the agreement was a provision to provide them will all new technological advances for the next five years.

J. Fred Bucy, president of Texas Instruments, Inc., is convinced that the "transfer of militarily significant technology has been of major proportions," and that the Soviets have narrowed the gap in military capability as a result. Bucy, a renowned physicist, notes that the seemingly harmless digital watch and hand calculator embody a technology with tremendous military potential.

Sen. Henry Jackson [D-Wash.] revealed that with minor changes such plants could be modified to produce "almost the entiire range of circuits for military applications." Integrated circuits, one must remember, were developed by the U.S. Air Force for its Minuteman missile program.

The May 1978 issue of *Electronics Warfare-Defense Electronics* magazine reported the presence of at least 50 Soviet spies in the electronics industry's so-called "Silicon Gulch" south of San Francisco. These spies make a daily report of the latest semiconductor data to Russia via a Soviet satellite that passes overhead.

The computational speed and memory capacity of each side's computer systems are as important in the strategic balance as the range and megatonnage of its missiles. All the new technologies — avionics, gyros, lasers, metallurgy, nucleonics, propulsion systems and even computer design itself — are dependent on computers.

We have sold IBM 360 and 370 series computers to the Soviet bloc. An IBM 360/65 was absolutely essential to the success of our manned lunar landing program.

As former top Pentagon and National Aeronautics and Space Administration (NASA) official Robert C. Seamans Jr. has pointed out: "The computer that's used in computation for lunar flights can also be important in a number of other strategic areas — all the way from air defense to deployment of strategic forces, tactical aircraft and ground forces. It's invaluable in gathering large amounts of data, assessing what's going on, redeploying and sending out the necessary commands."

Military Advances

Rep. Ben Blackburn of Georgia states: "We know that U.S. and British computer technology has enabled the Soviet leaders to advance development of their feared Mirvs from two to four years." During 1973 tests, Soviet boosters carried on-board computers for the first time, computers based on Western technology. Such computers are vital to Mirv accuracy, and the more advanced models the Soviets have, the more accurate the warheads become, and the more vulnerable our Minuteman/Titan force becomes.

On Sept. 30, 1976, the sale of a Control Data Corp. Cyber 73 system to the Soviet Union was approved despite Pentagon and Energy Research and Development Administration objections that it was suitable for nuclear weapons calculations, for antisubmarine warfare (ASW), for large phased-array radar to track intercontinental ballistic missiles (ICBM) and other military applications.

A system to kill deeply submerged submarines needs exact real-time oceanographic data and calls for computers the Soviets are incapable of building themselves. An ASW system must be permeated with computers: to build the ships and the weapons; to assure weapon reliability and accuracy; to navigate; to operate the sensors, integrate their signals and enhance their data; to determine hydrological conditions; to communicate; and to fight.

Only as we have provided the USSR with our technology have they been able to track and threaten our Polaris and Poseidon submarines.

Space does not permit the listing of military uses to which we put our so-called "business" computers, uses to which the Soviets can also and have also put them, uses which were formerly beyond their capabilities.

Profit Motive

It was the desire to improve the profit-and-loss statement that convinced some American industrialists 40 years ago to sell to Imperial Japan the scrap metal which Admiral Yamamoto was kind enough to return to us at Pearl Harbor. Today, the same profit motive is propelling Western businessmen to compete to fill, posthaste, the lucrative orders for machinery, manufactured goods and technology of the Soviet military-industrial complex.

Peace brings trade. Trade does not bring peace. Those who refuse to learn from history are condemned to repeat it.

Sobieski is a senior systems analyst with Associated Mills, Inc. in Chicago.

Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

Microdata Corp.'a Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems users survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 companies that use 689 small business CPU's.

Each respondent was asked to subjectively rate the vendors and their products on performance (whether stated equipment specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service snd support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

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Reality by Microdata

Recommends Five Packages to States

Labor Grants Funds for Report Systems

By Don Leavitt
CW Staff

WASHINGTON, D.C. — In what may be a precedent-setting move, the U.S. Department of Labor has evaluated a number of reporting systems and then granted funds to various state employment security agencies so they could acquire any one of the five recommended systems for their own use.

Although all states were eligible for the grants, only 43 have applied for and received them: the other states presumably are satisfied with whatever reporting system they already have.

The recommended package list included Mark IV from Informatics, Inc. and Easytrieve, the retrieval system from Pansophic Systems, Inc. as well as three other products. Thirteen of the states getting grants chose Easytrieve.

Justification for the evaluation effort and funding was easy, according to Labor officials. While federal employment reporting requirements were successfully being met each month with a Cobol-based facility called the Employment Security Automated Reporting System (Esars), researchers at the department discovered two years ago that the states were not using it extensively for their own internal reporting.

"Esars is a very large system and the states were finding it took lots of CPU time, lots of disk and tape storage and used lots of paper." Terry Wiram of Labor's system division explained. "While the federal reports contain an incredible amount of information, the states were extracting only bits and pieces for their own use.

"Often the information they needed wasn't even in one of the standard Esars reports, so they were forced to write new programs to create the output they needed. With fixed DP staffs and heavy work loads, response to requests for ad-hoc reports was painfully slow."

Search for Package

Wiram's group had become aware of the trend toward using packaged software and decided the states needed a comprehensive package for their own use. The states needed a system that was flexible enough for even the most nontechnical person to use, and the group decided it should come from a vendor who would give strong support and enhance the product to keep it up with the state of the art.

"The more we thought about this idea, the more we realized we should take the initiative and act as a clearinghouse for all the state agencies. Through mass acquisitions, we could save money and by doing the background investigations, studies, testing and reports, we could save each state the expense, time and headaches of such a large-scale search," Wiram continued.

The study began in 1977: Wiram was familiar with specific application packages but he knew the states really needed a broad information retrieval or data management system. For several months, he studied various software directories, including those from ICP, Datapro Research, Inc., Auerbach Publishers, Inc., the National Technical Information Service (NTIS), and also the Federal Software Exchange Catalog.

The study group found almost 125 packages that seemed able to present data in some logical manner, "so we sent a detailed five-page questionnaire to the vendors and asked them to reply. We received 50 responses."

From these 50 responses, Wiram selected less than 10 packages he wanted to test. But first he wanted to talk to current users, so he began tracking down several for each of his selections. "These weren't all vendor-supplied references," Wiram said, "so I felt I was likely to get honest responses.

Nine Test Sites

A year after Wiram began his search, six different report writers designed for IBM computers and three packages for non-IBM machines were each installed in a different state employment agency for testing. With installation, on-site training and support provided by each vendor, Wiram could con-

(Continued on Page 30)

Finite Element Program Works In Two-Dimensional Regions

HOUSTON — International Mathematical & Statistical Libraries, Inc., (IMSL) has introduced the Two-Dimensional Elliptic, Parabolic and Eigenvalue Problems (Twodepep) software, which a spokesman said is a small, easy-to-use finite element program.

Twodepep solves a large class of applications-oriented, time-dependent, steady-state and eigenvalue problems in general two-dimensional regions, the spokesman explained, adding that a preprocessor and an automatic mesh refinement and grading system help it to minimize user effort in solving "quite general partial differential equation problems."

Twodepep also includes support for auxiliary storage management, making possible the solution of large problems. The package reportedly solves high nonlinear problems and handles general regions including those with holes or curved boundaries.

Time-dependent or steady-state diffusion problems with one or two components — or even more with somewhat greater user effort — can also be solved by Twodepep, he continued.

Summing up, he said anyone who requires solutions to problems involving elasticity, diffusion, heat conduction, potential energy, Schroedinger equations, Navier-Stokes fluid flows or minimal surfaces will find Twodepep a "cost-effective addition to their system."

The package can be acquired under lease for $1,500/year, with discounts available for multiyear leases and a "substantial discount" to degree-granting educational institutions. IMSL is on the sixth floor of the GNB Building at 7500 Bellaire Blvd., Houston, Texas 77036.

'Docu-Text' Repriced, Enhanced

SAN JOSE, Calif. — Diversified Data Systems, Inc. has chopped the price of its OS-oriented Docu/Text documentation system and enhanced the capabilities of the OS/VS-oriented version of the software.

The package utilizes unmodified execution JCL streams as input and from that generates and maintains what a spokesman described as a comprehensive set of systems-level documentation. The resulting reports can be used for tracking such things as data set accesses and peripheral usage, he said.

The cost of the OS-based package has been reduced 46% and is now $1,200/year under a lease plan with maintenance. The perpetual license fee is still $7,500.

Release 3.25 of Docu/Text provides OS/VS users with extended IMS support and a new commenting capability. Highlighted in the IMS area is the ability to derive program names to be executed from PARM fields.

The comment facility provides a means of easily redocumenting an old system, he continued, remarking that this is useful in conversions where existing JCL is used in the new setting.

Diversified Data Systems is at Suite 205, 996 Minnesota Ave., San Jose, Calif. 95125.

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PRODUCTS FOR PERFORMANCE

CICS Users Offered On-Line Development Aid

NORWALK, Conn. — An on-line program development tool for IBM-based installations working with CICS, the CICS/MM package from Turnkey Systems, Inc. (TSI) eliminates the message management portions of the user's on-line programs, including all message "mapping" and most data editing.

By handling much of the "mechanics" of getting the work on-line, the package enables the programmer to concentrate far more effort on the application logic. This shortens the development cycle and that, in turn, provides several benefits, a spokesman said.

Display formats for both input and output are created interactively. No programming knowledge is required to create and test new formats: as a result, users without DP experience can participate in designing their interface to a new system even before any programming is done, the spokesman continued.

In addition to eliminating CICS "mapping," CICS/MM reportedly eliminates still more on-line programming by preediting all incoming data. Input edit rules, including arithmetic and table-lookup operations, are specified as the formats are created.

Since new formats can be tested immediately, formats and data editing criteria can be entered, tested and — if necessary — revised in minutes, "ensuring user satisfaction with the final result before the first line of code is written," according to the spokesman.

CICS/MM makes no modification to either CICS or the operating system, requires less than 40K bytes of virtual or real storage, runs under any IBM operating system and can be implemented on any hardware system that includes IBM 3270-compatible devices, the spokesman reported.

The package costs $14,000 or $390/mo on the 36-month or longer lease. Discounts of 20% are available to qualified educational institutions even on the first installation; other purchasers are offered discounts for multiple acquisitions.

TSI is at 50 Washington St., Norwalk, Conn. 06854.

Pascal Style Guide Debuts

ROCHELLE PARK, N.J. — A 224-page style guide, specifically intended for Pascal programmers who want to write carefully constructed, readable programs, has just been published by Hayden Book Co., Inc. Entitled *Pascal With Style: Programming Proverbs*, it was written by Henry F. Ledgard, John F. Hueras and Paul Nagin, a spokesman said.

The book offers guidelines that stress overall program organization and logical thinking. A chapter on the top-down approach is included in this $6.95 book, he added from 50 Essex St., Rochelle Park, N.J. 07622.

Labor Assesses Report Systems

(Continued from Page 29)

centrate on developing a comprehensive testing program. The result was a series of 13 reports to be developed and produced by each test site using a common test tape.

Wiram and his team were looking for:

- The ability to access variable-length files and records.
- The ability to access multiple record types within the same file.
- The ability to generate multiple reports with a single pass of a file.
- The ability to produce single or multiple reports from multiple files.

"We had a lot of table look-up in our benchmark and cross tabulations, selects on computed variables as well as data elements and conversion of data to descriptors. We wanted to edit out invalid numeric data as well as compute variables not in input data," Wiram explained.

"We validated the test results and asked each site for specific information such as estimated man-hours used to develop the reports, DP background of the programmer, copies of the report and the code written to run the test. Then we asked each agency to write an evaluation of its test package. The testing took about nine months and the results were compiled into a 282-page report," he said.

"In a very competitive situation, the Easytrieve site turned in some very impressive test results," he said. "For example, one of our test tapes contained more than 60,000 records, and the state agencies were asked to create a fairly complex summary report taking totals on control breaks with selection criteria and computations.

"I've had 13 years of Cobol experience and it took me three hours and five minutes to analyze, code and debug the benchmark program using Cobol. A systems analyst with less than three months' Easytrieve experience produced an identical report in one hour. And, compared to what I had thought was a compact 120-statement Cobol program, his Easytrieve program was complete with 32 English-like statements," Wiram stated.

As soon as installation in all the states is completed, Wiram will begin a follow-up project to see how the states like their new retrieval system.

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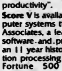
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Interactive DBMS Unveiled For PDP-11s Under RSTS/E

PALO ALTO, Calif. — Intac, an interactive data base management system (DBMS) that operates on Digital Equipment Corp. PDP-11s running under RSTS/E, is now available from Ross Systems, Inc.

The system provides a conversational method to establish data bases; to add, change and delete data; and to perform inquiries, generate reports and modify data file definitions. It also includes a set of create and access subroutines.

Intac's interactive query language was designed for use by non-DP-oriented as well as technically trained personnel. Ross' package includes a report program generator that uses English-like specifications to set the contents and form of any output.

Written in Basic Plus II and supporting multikey Isam files, comprehensive edit rules, multiple file access for reports and extensive programming functions, Intac costs $20,000.

The package can be ordered from Suite 208, 1900 Embaradero Road, Palo Alto, Calif. 94303.

'Datamanager' Tied to IMS/DC

LEXINGTON, Mass. — MSP, Inc. has announced an extra-cost option that allows its Datamanager data dictionary to interface with IBM's IMS/DC facility. Previous interfaces support linkages with IBM's CICS and Applied Data Research, Inc.'s Roscoe.

The interface includes preformatted CRT screens designed to simplify the entry of definitions and commands to the system. Screen selection is by program function key.

Running under IMS/DC as a normal user program, Datamanager can share regions with IMS programs and its data sets can be held in common with TSO and IMS/DC. The IMS/DC interface is available as a selectable unit for $3,000.

MSP is at 21 Worthen Road, Lexington, Mass. 02173.

Utility Lets System/34 Users Check Output

ASHLAND, Mo. — Usera of IBM System/34 small business systems have the opportunity to review various forms of normally printed output at a CRT screen on a workstation by installing the Spool View Utility (SVU), according to the vendor, CFS Industries, Inc.

SVU enables users to display the status of the print queue, display and review printed output or save the electronic version of printed output on disk or diskette for later review or printing.

To illustrate the significance of this software, the vendor said programmers could save both money and time by reviewing compilation listings and identifying errors even before the listings are printed. End users could save the images of customer statements for retrieval on the screen in case of any queries about items.

By providing a command language, the utility allows the operator to select a report, to page forward or backward through it or to identify a specific page for review.

SVU supports rolling up and down as well as left and right on a page, and users can start the display at any specified column so they can see the desired portion of what was designed as a 132-column page on an 80-column CRT screen, a spokesman said.

To use SVU, a site must have a System/34 CPU and an IBM 5251, Model 11 or 12, workstation. The utility costs $375, the spokesman said from Rt. 1, Ashland, Mo. 65010.

Package Replaces Isam and Vsam

CLIFTON, N.J. — CPU time for Vsam- or Isam-based batch work can be cut 20% to 40% while disk EXCPs and wall-clock time are usually cut in half in IBM-oriented centers using Version 4.0 of the Innovation Access Method (IAM) software, according to the vendor, Innovation Data Processing, Inc.

Redesigned to be a "drop-in replacement" or transparent alternative to IBM's access methods, IAM Version 4.0 is also said to provide better performance than earlier versions, which required application program changes.

Batch and On-Line

IAM is intended for use in both batch and on-line environments. The Isam transparency feature supports all languages under both OS and OS/VS, and specific on-line interfaces are available to put the software features under any of various teleprocessing monitors.

The interfaces are ready now for CICS from IBM, Intercomm — now from Software Design Associates, Inc. — and Task/Master from Turnkey Systems, Inc. A generalized on-line interface is also available.

The updated IAM, including transparency and the on-line interfaces, costs $10,000 for the first year, the spokesman said from 970 Clifton Ave., Clifton, N.J. 07013.

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The benefits of CICS/MM go far beyond reduced programming costs. Users get involved early in the design process. Formats are fully tested before programming starts. Applications are standardized and self-documenting. Control of formats and editing criteria is centralized. Application maintenance costs are minimized.

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"NCR's VRX has cut our run time by 36 percent," says Yasuhiko Okiyama of Sumitomo Bank.

OKIYAMA:
Sumitomo's sudden growth — from $900 million to $1.3 billion in a single year — has caused us to upgrade our EDP system. We are moving from an NCR Century 300 to two NCR V-8580's. And moving smoothly despite the pressure of increasing volume.

NCR's BOB SULLIVAN:
VRX (NCR's Virtual Resource Executive) is making a substantial contribution to increased productivity.

OKIYAMA:
We are using VRX to run our batch operations. VRX has cut our run time for these programs by 36 percent.

Yasuhiko Okiyama (left) is Vice President and Manager, Sumitomo Bank of California, San Francisco, the 92nd largest bank in the U.S. Bob Sullivan is an NCR district manager.

SULLIVAN:
Your online experience has been impressive, too.

OKIYAMA:
We have seen a 15.4 percent improvement in the handling of online transactions due entirely to the new generation hardware. And we know there will be another impressive jump in efficiency when VRX takes over the online operations. Under VRX, error recovery takes just seconds. With the old system, we needed a full minute.

SULLIVAN:
VRX offers full dynamic resource allocation and virtual memory with no rigid memory partitioning. You can run up to 35 jobs simultaneously. And Sumitomo will soon be using Online Program Development (OLPD), a feature of VRX that multiplies the effectiveness of a programming group.

OKIYAMA:
Still, the most significant point I can make about this move from the last generation of NCR equipment to the next is that our old programs continue to run. We are making the transition easily because none of our software has become obsolete as a result of the change in hardware.

SULLIVAN:
That's NCR's Migration Path Engineering. One of our primary objectives is to provide easy alternatives for our users as the demands on their systems change. To eliminate dead ends. So that every user can upgrade gradually as his volume grows.

In the NCR office near you, there is an NCR account manager like Bob Sullivan who knows your industry and knows NCR systems, including VRX. To learn more about what an NCR system can do for you, phone him at your local NCR office. Or write to EDP Systems, NCR Corporation, Dayton, Ohio 45401.

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Data Dictionary Can Impact Every Department

By Mike Hicks
Special to CW

Data is becoming an increasingly important corporate resource and must be controlled as carefully as any other major resource. One way for management to gain this control is to centralize all descriptive information about data in a data dictionary.

Implementation of a data dictionary can positively impact every department in a corporation, although the degree to which benefits are realized depends on the degree to which the dictionary is used.

A data dictionary can provide a wide range of benefits to every area — mangement, auditing, data base administration, programming and analysis, operations and the end users of DP services as well.

Management Control

Management most readily realizes dictionary benefits through improved control and communications in all levels of corporate activity. By enforcing standards and centralizing collection, control and use of all necessary definitions in the DP environment, a dictionary can offer quick access to information needed for top-level decision making and coordination.

A data dictionary system can also reduce labor-intensive activities by simplifying and automating many repetitive, error-prone tasks and procedures. In addition, the volume of data to be managed can be reduced by eliminating data redundancies. This helps to maximize productivity of both human and machine resources.

Since a data dictionary is the single source for all information and documentation about the entire DP environment, auditors have an effective, centralized mechanism for tracing the flow of data, functions and dollars throughout the corporation.

A dictionary's on-line documentation, cross-referencing and reporting capabilities allow audit personnel to evaluate and report easily on corporate, departmental and individual responsibilities. This increased accuracy in determining accountability can help set corporate direction by improving user communication and confidence.

DBA Assistance

A dictionary is invaluable in assisting data base administrators (DBA) with design, servicing and control of the corporate data pool. It simplifies the process of defining data and relationships by providing a quick, accurate means for building and verifying data base structures in a fully documented on-line mode. Cross-reference and inquiry capabilities permit assessment of the impact of change well before the actual change is implemented.

By eliminating unwanted data redundancies, hardware resources can be conserved through reduction of data base space requirements. Use of a data dictionary will minimize many of the errors associated with the DBA function by:

- Giving control and document information;
- Providing examination of data redundancy and control of future data redundancy;
- Providing accurate data definitions to be included in programs;
- Controlling the availability of sensitive data to particular users;
- Controlling test and production definitions of programs;
- Ensuring that maoagement objectives are obtained.

Since a dictionary provides automatic standards for enforcement, the DBA is assured of data uniformity and usability. A dictionary also aids in troubleshooting production activity by providing easily reportable structure information. Security is enhanced by controlling the access to definitions and dictionary functions.

A data dictionary should be the single source for all data base management system (DBMS) information. When this is true, system software personnel can use the dictionary to simplify maintenance and enhance the reliability of the DBMS.

In addition to using a dictiooary as the central source for all application data definitions, application analysts and programmers can use a dictionary as an effective design and development aid.

Application design activity is accomplished more quickly and accurately through on-line access, and new application development time is reduced when dictionary definitions are used to automatically and correctly generate (in desired programming language formats) control blocks and program input/output areas.

Operations Benefits

The DP operations function benefits from a dictionary in several ways. Use of a dictionary helps avoid production failures and speeds problem resolution, human error is reduced, and access security is improved. Inquiry and reporting facilities assist in operations problem-solving by showing the troubled area and determining responsibility.

Finally, end users benefit from the improved communications and responsiveness provided by a data dictionary. Communications improve not only between the users and the DP organization, but also between the users in various functions throughout the corporation.

Hicks is product manager for the UCC Ten data dictionary/manager software package at University Computing Co. in Dallas.

Pondering Possibilities — Part 2

Despite Problems, Pascal Called a Good Choice

By Russ Artzt
Special to CW

In this article, the second in a two-part series, the author — a vice-president of Computer Associates in Jericho, N.Y. — explains why Pascal was chosen as the language to be used in rewriting one of his company's packages. In last week's article, he explained why other languages were not chosen.

When Computer Associates decided to update CA-Earl, we examined PL/370 and Pascal in considerable detail. Sample programs were produced with each, and the ease of writing and the efficiency of the generated code were compared.

Pascal contributed to far higher programmer productivity — at least four times higher than assembler. PL/370, on the other hand, seemed more related to IBM's Basic Assembler Language (BAL), with a minimum of reasonable transportability.

Further investigation of Pascal revealed the following:

- Pascal provides a significant amount of logic testing during the compile phase. For example, defined fields and addresses can be assigned range values that the Pascal system uses for validity checking.

As a result, about the time the compiler is generating "error-free" code, the testing process has reached a more advanced stage. In addition, there is a "runtime checker" which speeds up the testing process.

- Compared with assembler, Pascal requires less source code generation by a factor of at least 10.
- With the help of the U.S.-based Pascal User's Group, all known available Pascal compilers for IBM 360s and 370s were evaluated. Versions of the compiler we chose run under batch OS and under VM/370's Conversational Monitor System (CMS).

VM/CMS is the main operating environment in our own 370-based development centers, although we also use Idos/VS, which is our interactive alternative to IBM's DOS/VS. With some additional work, the compiler was adapted for DOS application as well.

- During our feasibility study, it was decided that a top-down design should be used to permit analysis of the packages input syntax. This modular approach forces the use of only one routine within the package to perform any one function. This leads to a significant reduction in size.

As a result, package stability and ease of package maintenance would be greatly improved. New facilities could be added without the risk of affecting previously tested code in existing routines. We found Pascal to be ideally suited to this approach.

- The Pascal compiler we used (from the Stanford Linear Accelerator Center) allows executable code to be produced either directly from the compilation — or from the source-level assembler code. This latter option was felt to be particularly appropriate to the project.

Once the package was developed and released, the normal assembler-level maintenance offered by our worldwide regional support centers could incorporate support of the new CA-Earl without extensive training in Pascal.

Because of the "interpretive" nature of the Pascal compiler and the similar concept it forced on the designers of the new CA-Earl, we found the generated code to be somewhat less efficient when compared with assembler. However, we felt that the more flexible approach to design possible with Pascal and the improved facilities of the new version more than made up for this potentially slight degradation of performance.

Results of the Study

The CA feasibility study group completed its work in March 1978, and its recommendations to go ahead with an entire rewrite of the package using Pascal were accepted. Use of Pascal allowed us to:

- Develop the new version of CA-Earl within the time frame specified.
- Meet almost all of the programming requirements.
- Maintain compatibility with previous versions.

(Continued on Page 36)

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Programs Protected

FRAMINGHAM, Mass. — A package to protect Basic programs stored in Ascii form on Radio Shack TRS-80 microcomputers is available from Data Associates here.

Developed for a single-disk system with 32K bytes of memory, Unlist8 can guard against unauthorized modification and can make Basic programs confidential, the vendor said.

Hidden passwords and copyright notices can be inserted to prohibit listing or printing programs. The program can, however, be run, saved, loaded in memory or loaded or saved on disk, as usual, according to the vendor.

Code line numbers, a single line or specific blocks of line numbers can be unlisted. The package can also be used to "unprotect" or relist a protected program, provided the password for the program is known, the vendor said.

Since specific lines can be protected, other lines in a program can be changed or updated at will, the vendor added.

Unlist8 converts the named Basic program in Ascii form to a protected version. It also saves the program on the same disk under a new name selected by the user, Data Associates said.

Unlist8 costs $19.95 with an instruction manual and three copies of the program on cassette. The vendor can be reached at P.O. Box 882, Framingham, Mass. 01701.

RSX-11 Moved to LSI-11

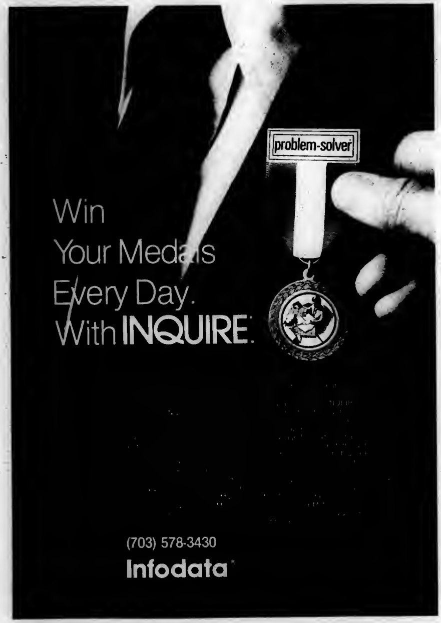
IRVINE, Calif. — An enhancement to Digital Equipment Corp.'s RSX-11M operating system that will reportedly provide full support to the DEC LSI-11 CPU is available from Plessey Peripheral Systems, Inc.

Plessey's PM-RSX-11M will run on mapped or unmapped, dedicated or multipurpose LSI-11 systems. Applications for the package include program development and industrial, scientific, business or communications applications. It also supports multitasking, dynamic memory management, the vendor said.

The Plessey enhancement offers a multiuser program development facility concurrent with real-time 250 software priority levels, which enables users to compile, install and debug tasks without affecting the real-time task response, the vendor said.

The DEC RSX-11M enhancement allows full support of the LSI-11 processor and full unmapped RSX-11M executive with file system and all DEC PDP-11 clocks. The enhancement also provides support of Plessey's expanded capacity disks and a set DSIZ command keyword option that allows the user to specify disk size, the vendor said.

Plessey's PM-RSX-11M operating system costs $4,780 and comes on magnetic tape, the vendor said from 17466 Daimler, Irvine, Calif. 92714.



Pascal Chosen After Study

(Continued from Page 35)

- Design a package that is open-ended for future incorporation of additional facilities and capabilities.
- Reach fairly rapid stability — the product proved highly reliable during beta testing at user sites and settled down very quickly.

Some Disadvantages

However, there were certain less favorable aspects of Pascal which resulted in necessary additional work. For example, Pascal does not lend itself to producing the "overlay" modules necessary to allow our new version to operate at a minimum level in a 64K partition. We were obliged to change the mode in which Pascal operated in order to maintain the required overlay environment.

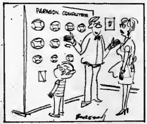
As it happened, the Pascal compiler we chose lacked certain I/O handling features. We built in all the routines required for both compile and subsequent package execution with assembler.

There were also some problems of operating environment dependency. Specifically, certain aspects of physical-level I/O and memory management native to the IBM environment could not be conveniently overcome using Pascal. We resolved these problems by the use of assembler.

Finally, Pascal did not provide patchable executable code. However, its ability to generate source-level Assembler code enabled us to modify the generated source code and solve the problem.

In conclusion, we feel that while the completed package is not totally transportable, 80% of it is, so primary design objectives have been met successfully.

We have satisfied ourselves that Pascal has proved an extremely valuable devlopment tool. We have achieved a significant experience in its use, whicb we are certain to exploit profitably in the future.



'I Want Him to Have All the Things I Didn't Have When I Was a Kid.'

Comments to FCC Stir Debate On Accounting

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C. — What kind of accounting system should be established to keep AT&T honest? This question continues to provoke a hot debate at the Federal Communications Commission (FCC).

A year and a half ago, the commission said it wanted to revise telephone industry accounting procedures — formally known as the Uniform Systems of Accounts (USOA) — and asked interested parties for their comments on a number of related issues. Last August, after reviewing the first round of responses, the commission aaked a new set of questiona, and these were answered last month.

AT&T said the accounting system it has in mind is "closer in concept" to the FCC's views "than was perhaps originally realized." The company added that its proposed "system structure" implements the commission's intentions "in effect."

Possibly agreeing with AT&T on this point, the Independent Data Communications Manufacturers Association (IDCMA) argued that the commission has overlooked some key problems in its requests for comment; as a result, whatever new accounting system emerges from the present proceeding will fail to prevent AT&T from unfairly cross-subsidizing its competitive services. The commission has stated that one of its major reasons for changing the USOA is to prevent such cross-subsidies.

"It is clear that onless the costs of all activities associated with the carrier offering of terminal equipment are retrieved, a

(Continued on Page 38)

Says Rates Based on Cost Estimates

IDCMA Asks FCC to Nix Dataphone II

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C. — "AT&T's 'cost studies' do not reflect or even purport to reflect that actual costs of the devices at issue in this proceeding."

So said the Independent Data Communicationa Manufacturers Assocation (IDCMA) late last month when it petitioned the Federal Communications Commission (FCC) to reject AT&T's proposed Dataphone II tariff, now scheduled to become effective Jan. 24.

The tariff encompasses a new line of intelligent modems, which operate at 2,400- to 9,600 bit/-sec, together with a centralized, highly automated network troubleshooting system [CW, Nov. 12].

AT&T has derived many of the coats of Dataphone II service "from estimates," IDCMA contended. Also, "the expenses of AT&T affiliates such as Bell Telephone Laboratories . . . and Western Electric are not even ascertained — let alone retrieved.

"In making these allocations, AT&T does not differentiate between equipment or transmission, competitive or noncompetitive aervices," the IDCMA added.

Second Objection

The association's other major objection to the proposed tariff is that it allegedly continues a tactic the FCC declared unlawful last October. At that time, the commission said "Unjustified and unlawful tariffs have remained in effect often for years while under investigation, only to be replaced by other tariffs which themselves are later found to be unlawful."

That quote comes from an FCC decision rejecting AT&T's Multischedule Private Line (MPL) rates, which cover charges for individual voice-grade private-line services. The MPL rates, which went into effect in 1976, have been the object of an extended FCC investigation.

In October, the commission ordered the phone company to develop new rates based on an "interim cost allocation procedure." Bell was given until mid-1980 to make this change while the old rates remained in effect. The FCC ordered AT&T to implement the new cost allocation procedures "for all tariff filings made after the effectiveness of the [MPL] order," IDCMA pointed out.

The association added that the commission also ordered AT&T to explain how it intends to implement the new procedures. This latter information was supplied late last month, but it was supposed to be developed well before Oct. 26, the date AT&T filed its Dataphone II tariff.

Major Complaint

IDCMA's major complaint is that "despite the commission's unambiguous directives," AT&T failed to base its costs for Dataphone II service on the interim procedures. Instead, the phone company told the FCC that an

(Continued on Page 38)

Swift Operations Center Starts Up in Culpepper, Va.

CW Washington Bureau

CULPEPPER, Va. — The Society for Worldwide Interbank Financial Telecommunications (Swift) has opened a North American Operations Center here, the third in its rapidly growing network.

Founded in 1973 by 239 banks in Europe, the U.S. and Canada, Swift started up its network in September 1977. It initially served 15 countries; today there are close to 750 members and the network links 26 countries.

In a single day last June, the Swift network handled more than 150,000 messagea involving several types of transactions.

The North American operations center here in Culpepper, about 65 miles south of Washington, D.C., serves North and South America and the Far East. Other centers are located in Brussels and Amsterdam.

Each center communicates with member banks through a concentrated "regional processor" and leased domestic circuits within each country.

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Handles Calls to 1,243 Users

CBX Lightens Utility's Customer Service Load

By a CW Staff Writer

SALT LAKE CITY, Utah — A large power company here has found its four month-old computerized business telephone system (CBX) easier to operate and more flexible than its previous switching system.

Utah Power and Light Co. (UP&L) began to run its system in August. The CBX handles 1,243 employee users and should cost less than the system it replaced when amortized over a 10-year period.

And it makes possible highly flexible communications between the different parts of the utility, according to Dennis Young, the firm's telephone maintenance supervisor.

Serving customers throughout most of Utah, southeast Idaho and southwest Wyoming, UP&L uses a pair of Rolm Corp. CBX switches at its service and division offices, tying them to Rolm's Large-size CBX (LCBX) at UP&L's general offices here.

The CBX system automatically answers, generates and distributes calls on a first-come, first-served queing basis and generates printed statistical reports on line volume and incoming traffic distribution. The LCBX serves as a switching point for 50 tie trunk lines to the utility's outlying offices and generating stations around the state.

Reason for Purchase

UP&L purchased the equipment largely because it wanted to improve the quality of its customer service and to adequately coordinate repairs, storm service and other activities from its downtown office and its Salt Lake service center.

The utility found that it would not have to concern itself with obsolescence because the Rolm system is organized on a computer program instead of a hard-wired system. This makes it far easier to reconfigure, according to Young.

In addition to the switching system, UP&L uses 145 of Rolm's Electronic Telephone System (ETS) 100 phones. These allow the firm to retain its present three-wire connection system while providing a variety of other communications abilities it did not have before.

For instance, a secretary at an ETS 100 can answer any ringing extension — noting which extension is being called on a lighted electronic display — then transfer the call to any single-line phone in the system.

"I can turn a conversation [between two people] into an eight-party conference call, which no conventional phone could do," Young noted.

No Complaints

Young had no complaints about the Rolm system. Rolm provided training for three of its electronic maintenance personnel at its Santa Clara headquarters. To date, they have been able to handle about 95% of the problems that have cropped up.

In spite of minor circuit board failures (about two a week), UP&L has endorsed the Rolm system to prospective buyers, Young said.

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Comments Stir Accounting Debate

(Continued from Page 37)

vertically integrated carrier such as AT&T will be able to continue to subsidize competitive terminal equipment offerings with monopoly revenues," according to the IDCMA, a trade association representing the nation's major modem makers.

"The exclusion of Western Electric and Bell Telephone Laboratories from the [proposed] accounting system will unreasonably restrict the ability of the commission to determine, let alone assure, the lawfulness of AT&T's rates for such equipment," IDCMA added. "If [these] entities are to be outside the scope of the accounting system . . . the FCC must find some other method to prevent the serious problem of intercompany cross-subsidization."

The Association of Data Processing Service Organizations (Adapso) criticized the commission for ignoring the anticompetitive threat posed by "tying," which it defined as an arrangement enabling a firm to use "the strength it possesses in one aspect of its operation . . . to enhance its sales or profits in another part of its operations . . . by coupling the sale or lease of two or more goods or services.

"In other words, economic power over one product (the tying product) is used to induce customers to purchase another product (the tied product) for reasons unrelated to the price or quality of the tied product. Ties may involve coercion or they may be voluntary . . . [but] whether voluntary or involuntary, the effects . . . are the same: the suppression of competition."

To prevent tying, Adapso indicated the commission should require AT&T to form fully separated subsidiaries for its competitive services, in addition to imposing a new uniform system of accounts.

Instead, the FCC, as reflected in the questions it has asked in the USOA proceeding, "appears to regard "cost-of-service accounting systems and . . . structural separation [as] mutually exclusive regulatory alternatives."

IDCMA Hits Dataphone II

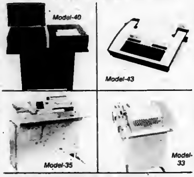
(Continued from Page 37)

"initial review" of the MPL decision "indicates" it will have "minimal effect" on the costs underlying the Dataphone II tariff filing.

AT&T has in effect stated that it need not provide data which the commission has deemed essential on the sole basis that in its view such data is not necessary. If . . . carrier accountability is to be realized, the commission must make it clear that carriers are not to be allowed to disregard valid commission orders at will," the IDCMA maintained.

At the bottom of this controversy is AT&T's insistence on continuing to assign many costs of its private-line services to MTS/WATS. The FCC, in its MPL decision last October, said "the record clearly reveals that AT&T [has] employed a 'basic service' approach to allocate local exchange plant costs . . . . Through its continued use of these residual costing techniques, AT&T retains the freedom to load, arbitrarily and unlawfully, all costs not allocated to other services on MTS users.

"AT&T's failure to calculate exchange plant costs for MTS directly [makes] it extremely difficult to verify that [private-line] costs have not been improperly assigned to the residual [MTS/WATS] services."



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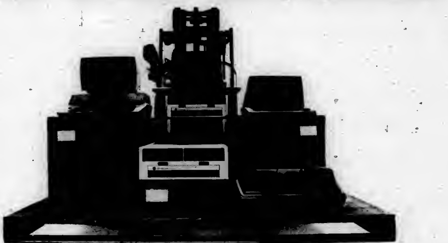

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Transmission Converters Introduced

COSTA MESA, Calif. — With a transmission protocol converter from MSI Data Corp., portable terminals that output 8-bit Ascii or 5-bit binary code can interface to any host computer with synchronous line controllers, the vendor said.

The MSI 2731 is installed between the host computer's input port and a modem. It controls the modem, reverse channel, code and speed conversion while remaining transparent to the host processor, MSI said.

In its automatic mode, the converter determines from the first character received what kind of terminal is transmitting and locks onto that transmission.

When the converter is in manual mode, front-panel switch settings allow the user to configure parameters for reception of a particular transmission type, the vendor said.

The 2731 handles incoming data transmitted at rates ranging from 110- to 1,350 bit/sec — when using an AT&T 202 or equivalent modem — and outputs an 8-bit character code at 1,200- to 9,600 bit/sec.

The protocol converter costs $2,000.

MSI also released its Model 2732, which converts asynchronous transmissions from portable terminals for any host computer or communications controller utilizing IBM bisynchronous, 3780/2780 or 3741 protocol.

The MSI 2732 can also output data from a terminal to its own optional one- to four-drive diskette subsystem, allowing it to function as a two-line stand-alone receiver. Each disk drive is a 256K-byte unit.

When connected to a local bisynchronous loop, the MSI 2732 appears to the host as an AT&T synchronous-type modem receiving data from either an IBM 3780/2780 or 3741, according to MSI.

The MSI 2732 costs $6,000 without diskettes. It is priced from $8,000 to $13,000 with the diskette subsystem, MSI said from 439 Fischer Ave., Costa Mesa, Calif. 92626.

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...the full line of ITT Courier information display terminals. Compatibility with the Honeywell VIP 7700/7760 makes replacement easy. Compatibility, combined with years of experience in building terminals that help people to do more with the computer, make ITT Courier terminals the world's finest choice for the Honeywell terminal user.

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Functionally, ITT Courier terminals surpass basic Honeywell capabilities with display sizes of 960 characters and 1920 characters, a wide spectrum of printers, and three VIP compatible controllers. Three different keyboards are available. Terminals may be stand-alone or clustered, with redundant controller models available to yield unusually high system availability. An optional diskette subsystem may be attached for efficient Distributed Format Storage or economical Deferred Data Transmission.

Honeywell system compatibility is just one more reason the performance-tested family of ITT Courier terminals are the world's largest Honeywell VIP 7700/7760 and IBM 3270 replacements, with an installed base of equipment today surpassing a quarter billion dollars.

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Zentec Debuts Smart Terminal At Comdex '79

LAS VEGAS — A little-known manufacturer of intelligent CRT terminals last week introduced a "smart" terminal that reportedly offers performance comparable to a Lear Siegler, Inc. ADM-31 and similar units from other makers.

Zentec Corp. described its latest offering, Zephyr, as the first member of a smart terminal family that costs less than competing models from Lear, Hazeltine Corp., Beehive International, Inc., Applied Digital Data Systems, Inc. and others.

Shown last week here at the Comdex '79 show, Zephyr is based on an Intel Corp. 8085 microprocessor. The terminal has a 12-in. CRT that displays 24 80-char. lines, with a 25th line for status information and error messages.

The terminal stores up to two 1,920-char. pages. Its 128-char. Ascii character set can be enhanced with program-controlled CRT features like reverse background, blinking and underscoring, Zentec said.

The terminal provides intelligent features like cursor addressability, editing and protected-form mode. As part of an integrated keyboard, Zephyr offers a numeric keypad, cursor control keys, 12 special-purpose function keys and 16 programmable function keys.

Zephyr offers both RS-232C and 20mA interfaces. A serial printer interface operating at speeeds up to 9,600 bit/sec is optional.

The Zephyr costs $1,200 from Zentec at 2400 Walsh Ave., Santa Clara, Calif. 95050.

Phone Net Future Topic of Seminar

NEW YORK — How will the development of digital systems affect the telephone network of the future? A one-day seminar held here on Jan. 22 by Probe Research, Inc. will explore the problems and opportunities of the digital revolution.

Probe Research will hold the seminar to identify and analyze such issues as the new features required for a digital environment, the "digital traps" that might lure unwary customers and the future of fiber optics.

The seminar will be conducted by Lee Goeller, author of a study entitled "The Digital Future of the Telephone Network."

A fee of $195 includes seminar materials and lunch at the Biltmore Hotel, according to Probe, which can be reached at P.O. Box 251, Millburn, N.J. 07041.

Long-Line Adapter Fits Vector General Units

WOODLAND HILLS, Calif. — Users of Vector General, Inc.'s Series 3300 and 3400 graphics display systems can order a long-line adapter to run remote digital devices up to 600 ft. from the main controller.

The option allows the remote placement of keyboards, function switches and data tablets. The adapter costs less than $2,700 from the vendor at 21300 Oxnard St., Woodland Hills, Calif. 91364.

Dear Ma:

With Racal-Vadic's VA3434 acoustic coupler, every telephone becomes a 1200 bps full duplex data link.

Racal-Vadic is in full production on an acoustic coupler that operates at 1200 bits per second, full duplex. Thousands are already installed and operational.

This is great news for remote terminal users who will no longer have to settle for 300 bps acoustic operation. Now, merely by replacing your present coupler with the VA3434, you can step up to 1200 bps full duplex, using the same 103 type protocol, yet retaining the portability that only an acoustic coupler provides. And since data flows 4 times faster, phone charges may be less, too.

[illegible] good news. The VA3434 is compatible with Racal-Vadic's VA3400 Series, including the VA3467 computer site triple modem.

Where can you obtain the VA3434? Easy. Just phone the nearest Racal-Vadic stocking rep. They're listed below.

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IDS Expands Test Family

Modem Tester Based on MPU

LINCOLN, R.I. — A microprocessor-based polling tester that tests modems over simulated or actual switched networks is available from International Data Sciences, Inc. (IDS).

The Model 1700 can also be used for private-line point-to-point nets or private-line multidropped nets. The tester is claimed to reduce downtime and improve maintenance efficiency by polling on-line data communications equipment for fault isolation and by verifying acceptable system performance.

The 1700 can distinguish between outbound and inbound polling message errors and allows deliberate injection of these errors to verify that integrity safeguards are functional, IDS said. The tester costs $1,800.

Selector Switch

IDS also unveiled a selector switch as well as a bit error rate tester and EIA breakout panel.

The Model 8506-D selector switch is used to switch the 15-pin EIA RS-232 or CCITT V.24 interface to either of two outputs. It can reportedly switch one modem to either of two front-end processor data channels or to either of two data terminals. The 8506-D can also switch a data channel from its on-line modem to a backup modem or can switch from a leased line modem to a dial-up modem. It costs $155.

Test Set

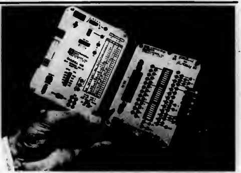
The Model 65/60 is two separate test pieces in one.

The Model 65 is a self-contained test set capable of analyzing the bit error rate of digital data communication channels. It contains separate transmitter and receiver sections that allow full-duplex tests to be performed in either end-to-end or loopback configurations.

The Model 60 is an EIA monitor and breakout panel.

The 65/60 costs $850. Battery chargers are $20 and come in two models — the 22 and 23 — for 115V and 230V operation, respectively.

IDS is located at 7 Wellington Road, Lincoln, R.I. 02865.



The Model 65/60 Test Set and EIA Monitor

Breakout Box Allows Testing Of RS-232C Path

WOODBURY, N.Y. — Users can reportedly refigure their RS-232C interfaces when interconnecting new devices or troubleshooting existing networks with a breakout box from Remark International, Inc.

The Model 50 contains 24 miniature switches that allow each signal of the interface to be individually opened. Two sets of 24 test points — one set on each side of the switches — facilitate patching of the interface configuration and signal monitoring.

The breakout box includes common bus areas for multipoint connections, according to the vendor.

A user can find defective network components by performing loopback functions anywhere on the RS-232C or CCITT data path. When operated in conjunction with Remark's Model 40 line monitor, the Model 50 works as an interface tester.

The Model 50 is supplied with six jumper plugs and costs $79 from Remark at 4 Sycamore Drive, Woodbury, N.Y. 11797.

Bit-Oriented Protocols Monitored

SPRINGFIELD, Va. — A diagnostic line monitor from Dynatech Data Systems, Inc. reportedly operates with all standard communications formats and protocols and with new and future bit-oriented protocols.

The microprocessor-based Dyna-Test 1500 provides operator-prompting through a 5-in. diagonal CRT to aid in defining a system's protocol and to perform data line monitoring functions. It operates with up to five languages; Ascii and Ebcdic are standard.

Capable of operation at speeds up to 110K bit/sec, the Dyna-Test 1500 features a nonvolatile memory, interface breakout panel and a 200,000-char. mass capture tape system. The system monitors, displays and records data, shows the status of six control leads, displays transmission errors and traps data on character strings.

The monitor operates with CCITT V.24, RS-232C and MIL-188 interfaces. CCITT V.35, Bell 303, IBM 3600 and RS-449 interfaces are available as options.

The monitor costs $4,700 without tape and $7,000 with tape, the vendor said from 7644 Dynatech Court, Springfield, Va. 22153.

Bell-Compatible Modems Feature Integral DAA

PALO ALTO, Calif. — Users can transmit 300 bit/sec asynchronous data without an external Data Access Arrangement (DAA) with three modems from Prentice Corp.

The Prentice P103J originate/auto-answer, P113C originate and P113D. auto-answer modems directly replace the Western Electric Co. 103J, 113C and 113D modems, respectively. They are also end-to-end compatible with Prentice 113A/B and E Western Electric 113A/B and 212A modems, Prentice said.

With a standard RS-232C interface and a line interface defined ir. Part 68 of Federal Communications Commission regulations, the three units offer half- or full-duplex transmission and reception of serial binary asynchronous data over two-wire dial-up phone facilities.

An integral DAA allows direct connection of the modems to the switched telephone network by means of a modular jack. Moreover, the modems include built-in diagnostics.

Stand-alone versions of the P103J, P113C and P113D cost $470, $385 and $395, respectively, and include the modem card and power supply. Rack-mounted systems are also available, Prentice said from 795 San Antonio Road, Palo Alto, Calif. 94303.

RS-232 Monitors Offer Switching, Cascade Abilities

PALO ALTO, Calif. — A trio of RS-232C interface monitors are available with three-way switching and cascade ability from Giltronix, Inc.

The line monitor section monitors the interface signals with LEDs, while the three-way switch allows a variety of system configurations. The units can be cascaded to allow the switching of an unlimited number of devices, Giltronix said.

The Models GRS 232-SM8 and GRS 232-SM16 monitor eight and 16 channels respectively, while the GRS 232-SMC offers monitoring for 16 channels plus a pair of options:

- Signal monitoring, which is accomplished by connecting an eighth LED to any one of the 25 EIA pins to monitor a specific EIA signal.
- An additional switching option that allows the user to define any three EIA pins to replace pins 17, 18 and 25.

The GRS 232-SM8 and 232-SM-16 cost $149.95 and $179.95 respectively, while the 232-SMC costs $199.95, a spokesman said from 3156 Avalon, Palo Alto, Calif. 94036.

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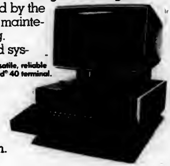

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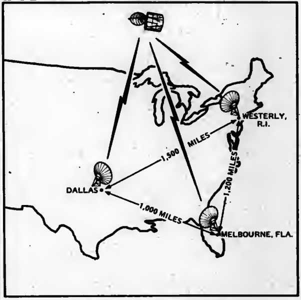
Harris Asks FCC Approval For Private Satellite Net



Harris Corporation's Private Satellite Communications Network

Harris Corp.'s Proposed Private Satellite Network

MELBOURNE, Fla. — Harris Corp. has applied to the Federal Communications Commission (FCC) for authority to construct and operate a satellite communications system to transmit information between its Florida, Rhode Island and Texas facilities.

The network will permit two-way television communications as well as voice, data and facsimile message transmission and may save 10% to 20% on the company's $5 million annual costs for long-distance phone and communications service, according to the firm.

If the private network is approved, Harris will install earth stations at the sites in six months, each with a 36-ft diameter "dish" antenna designed and manufactured by the firm. It will lease satellite time on Western Electric Co.'s Westar III satellite.

One of the satellite terminals is to be located at company headquarters here in Melbourne, a second will be located in the Westerly, R.I., plant and the third will be installed at Harris' Dallas-based Data Communications Division.

Other Harris divisions will be served from the closest of the three satellite earth stations, which should be lower long-distance costs. The system may eventually be used for electronic mail, communicating word processors and high-speed, high-resolution facsimile transmission, Harris said.

RCA Americom Proposes Spare Ground Satellite

PISCATAWAY, N.J. — RCA American Communications, Inc. (RCA Americom) has asked the Federal Communications Commission (FCC) for the authority to construct an additional communications satellite to be used as a ground spare for a planned in-orbit system to operate in 1981.

On filing its application, RCA indicated it has demonstrated that sufficient demand exists for its four in-orbit Satcom satellites and that a ground spare should be available for launching should one of the orbiting systems fail.

The $24 million spare will have the same essential elements as those already authorized by the FCC, but will add technological improvements such as four on-board spare amplifiers for each bank of six primary amplifiers, according to the common carrier.

RCA will also install 5.5W traveling wave amplifiers in place of the 5W systems used in Satcom Models I, II and III, a spokesman added.

Cassette Reader Unveiled

VAN NUYS, Calif. — A cassette reader for NCR Corp. 250 and 2140 cash registers can be remotely controlled by Ascii commands through an RS-232C serial interface, according to its vendor, Interdyne Co.

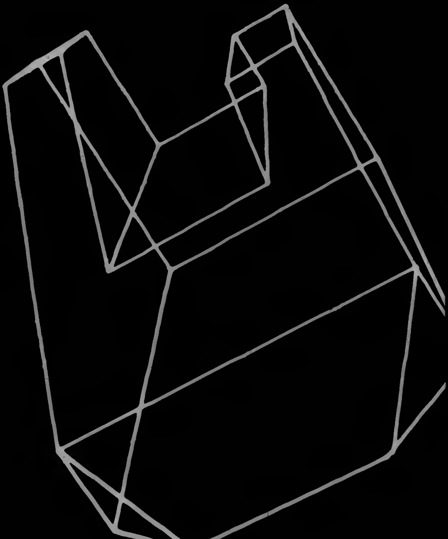
The Interfaced Cassette Systems (ICS) 3802-NCR-2 is a read-only buffered cassette system that accommodates blocks of up to 440 bytes (optionally available for up to 940 bytes) at rates from 110- to 19.2K bit/sec, according to Interdyne.

The desktop 3802 works with Basic and Cobol, as well as lower level languages. It costs $2,050 from Interdyne at 14761 Califa St., Van Nuys, Calif. 91411.

Hewlett-Packard

Computer Advances

Vol. 4 No. 5 December 1979



The matrix machine

The Vector Instruction Set (VIS) gives the HP1000 F-Series computer a capability unique in the minicomputer industry: efficient and fast operation on matrices of data in a 16-bit computer.

VIS, a set of microcoded CPU instructions, fits the F-Series for applications that require manipulation of large, multi-dimensional arrays of data such as statistical analysis, 3D graphics rotation, structural analysis, image processing, and electronic circuit simulation. Such applications frequently require that a company purchase time on a mainframe, or buy a large computer, even when most of its applications do not justify such an expense.

With VIS, the HP1000 Model 45 becomes the Matrix Machine, the optimized system for scientific and engineering computation. This F-Series model comes with the RTE-IVB real-time executive operating system, which can manage up to 2 million bytes of main memory. The base system includes the 2648A graphics terminal, GRAPHICS/1000 software package, and the high-performance HP7906 20-megabyte disc drive.

- The HP1000 F-Series with VIS will provide the fastest minicomputer solution to many matrix operations.
- It can avoid the "overkill" of buying an expensive computer for a few speed-critical operations.
- And it provides room for expansion by speeding up present operations and freeing the CPU for other jobs.

Vector arithmetic

VIS expands the computational power of the F-Series processor by speeding matrix computations.

In most small computers, matrix operations are executed in FORTRAN DO loops, in which a single pair of numbers is brought from memory and combined according to the specific instruction, then the next pair brought, etc. The overhead associated with these fetch operations eats up CPU time.

VIS acts directly on whole groups of numbers, called vectors, improving execution speed by an order of magnitude.

The basic element of a vector, called a scalar, has a single distinct value. A vector is a set of scalars that share some common attribute; they may be X-axis coordinates, for example, in a 3D graphics problem.

Pipelined processing

The F-Series computer performs vector arithmetic; that is, a single VIS instruction tells the CPU that the operation is to be performed on all scalars in a given vector.

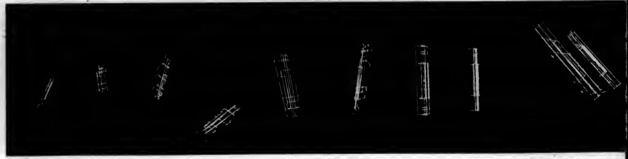
With such an instruction, the CPU can pipeline the HP1000 floating point processor so as to achieve parallel processing of several elements in the vector. While the floating point processor is operating on two scalars, the CPU fetches the next pair from memory. Without VIS, the CPU would have to return to the DO loop for a new instruction each time it completed an operation, and then go search for the next pair of scalars.

Managing DO loops and chasing scalars can account for 90 percent

---

◀ **Cover (and below)**

Rotating in accordance with calculations supplied by the Vector Instruction Set, the image of an object can be viewed from any angle on a Hewlett-Packard 2647A graphics terminal. These images and the one on the cover were generated by a matrix rotation program running on an HP1000 F-Series computer with micro-coded instructions for performing vector arithmetic.



of matrix computation time. Here's an example:

Rotating an image

A 3D image may be rotated a specified amount by multiplying its present XYZ coordinate matrix by a rotation matrix. In FORTRAN, this operation must be carried out by multiplying each element in each rotation matrix column by each element in each coordinate matrix row. It takes nine multiplications and nine additions to establish a single point.

The FORTRAN instructions for rotating a 1000-point image look like this:

```
DO 10 I=1, 3
DO 10 J=1, 1000
  B(I,J)=0.0
DO 10 L=1,3
10 B(I,J)=B(I,J)+R(J,L)*A(L,J)
```

The execution time is 920 msec.

With VIS, the HP1000 can simplify the operation. Instead of a series of separate multiplications, VIS multiplies each rotational coordinate by an entire column of the coordinate matrix. The instructions look like this:

```
DO 10 I=1,3
CALL VSMY (R(I,1), A(1,1),3,
  B(I,1),3,N
CALL VPIV(R(I,2),A(2,1),3
  B(I,1),3,B(I,1),3,N
10 CALL VPIV(I,3),A(3,1),3,
     B(I,1),3,B(I,1),3,N
```

The execution time using VIS is 90 msec.

Mainframe capability

Working with large matrices efficiently requires fast access to large blocks of data, larger than normally available in 16 bit computers. A 400 x 400 matrix of floating point numbers, for example, requires a single block of 640,000 bytes of main memory.

The HP1000 computer systems have a unique feature called Extended Memory Area (EMA), that allows single blocks of data (matrices) as large as almost two million bytes to be specified without the need for special segmentation schemes. For a look at how EMA operates, see page 5.

Since vectors are arranged in memory in an orderly manner, the Vector Instruction Set can provide high speed access to matrices in the Extended Memory Area. The combination of VIS and EMA makes for a powerful matrix processing machine.

The chart on this page shows that the HP1000 F-Series with VIS can invert a 400 x 400 matrix of floating point numbers in 11 1/2 minutes. That's mainframe performance—at a fraction of the cost. The HP1000 F-Series is priced as low as $13,750.

To learn more about matrix operations on the HP1000 F-Series, check A on the reply card.

32-BIT PERFORMANCE IN A 16-BIT MACHINE

Very large matrices will normally overflow the addressing capabilities of a computer that uses a 16-bit word, so that the machine either cannot perform the application or has to resort to disc memory, drastically slowing the performance.

The HP1000 with EMA and VIS overcomes this limitation on small machines at a fraction of the cost of a large mainframe. We ran a matrix comparison test between the 16-bit HP1000 F-Series computer with VIS and one of the fastest 32-bit computers on the market. Here are the results:

MATRIX INVERSION

Matrix Size	F +VIS	32-bit computer
50x50	1.8 sec	1.5 sec
100x100	12.3 sec	11.7 sec
200x200*	105.0 sec	92.0 sec
400x400*	690.0 sec	720.0 sec

*EMA used

Session Monitor slices time

The Session Monitor for the HP1000 computer series, part of the RTE-IVB operating system, allocates and protects system resources when the computer is accessed by many users for both real-time and session activity.

Functionally, the monitor is a layer of software above the operating system. Following criteria set by the system manager, the monitor:

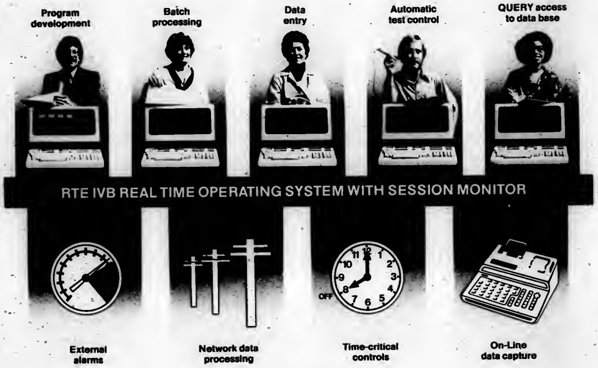
- Controls and coordinates access to work-station instruments and system peripherals such as discs and line printers:
- Assigns CPU time according to predetermined program priorities.

Time for everything

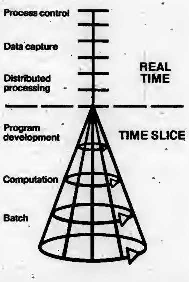
With the Session Monitor, the HP1000 can support program development, data entry, data base query and similar jobs that are not time-critical, and at the same time be used to monitor real-time processes and respond to them.

Every 10-millisecond clock tick, and on device interrupts, the monitor scans the program list to make sure that the highest priority program is running. Real-time activities, such as data capture, time-critical controls, or external alarms, are handled by an absolute priority. The tasks are carried out to completion unless preempted by an activity with an even higher priority.

Session activities are time-sliced; they are placed in a queue that is logically circular, with one queue for each priority level. The "fence" between real-time and ses-



Session Monitor allocates CPU time to different classes of users according to a priority schedule set up by the system manager. Session activities, which are not time-critical, can be carried out concurrently with real-time data capture and control functions, with no danger that the background sessions will interfere with time-critical functions. Session monitor is now included in RTE-IVB software package for the HP1000 computers.



This diagram shows how Session Monitor slices time both vertically and horizontally. Above a "fence" level selected by the system manager, programs execute strictly according to priority. Below the fence, programs share time as it becomes available. If six programs with equal priority are running, they each get a sixth of the CPU time alloted to that level.

sion activities is set by the system manager.

Schematically, the time-sliced layers resemble an inverted cone. The lower a program's priority, the lower its representation on the cone. Since the cone widens toward its base, low-priority programs get longer time slices when they are allocated CPU time. The slope of the cone's edge may be varied by the system manager.

Low overhead

By pre-setting priority levels, the system manager can load-balance the system without incurring the CPU overhead that accompanies heuristic algorithms. The RTE-IVB operating system explicitly recognizes that the user knows more about system workload than a sophisticated algorithm can.

User devices are assigned according to a list attached to the log-on IC. The system keeps track of what instruments are being monitored at which stations, and keeps records of connect time and CPU time for each user. I/O and data storage devices may be designated by the system manager for particular users or groups of users, protecting files against unauthorized or accidental alteration by other users.

Tailor-made terminals

The monitor tailors an individual terminal to the needs of the person using it. A technician, for instance, may need no more than the ability to load data. A supervisor needs access to certain files to compile reports. A programmer can store new programs without worrying about their being changed or lost. The system manager can access the whole system and change it as needed.

RTE-IVB also provides spooling capability so that users can have access to peripheral devices, such as printers, without having to wait for the printing to be finished before continuing with other work.

In this way, the system ensures that the full capability of the HP1000 will be optimally distributed for the individual user's job mix.

Check B for literature on HP's RTE-IVB Session Monitor.

EMA:

Virtual memory in the central processor

Through the use of the Extended Memory Area (EMA), the RTE-IVB operating system can put the entire two million-byte physical memory of the HP1000's central processing unit, less only space for the operating system and the user code, at the service of a single program.

EMA looks to the user very much like disc storage. Its data is not directly addressable, but must first be brought into the 32K-byte logical address space of the program. To do this, part of the EMA is used for a Memory Window Segment (MSEG) to map the location of desired data.

EMA is user-transparent, and is called through simple FORTRAN statements.

When an element located in EMA is called by a program, the segment containing the element is mapped into the logical address space. Because this mapping requires no disc swaps, EMA provides fast retrieval of random access data.

With a Vector Instruction Set (see pp. 2-3), the retrieval of elements of arrays and matrices can be faster, since a single mapping locates all desired data.

EMA can be made to run faster for specific applications by writing memory management routines. Many separate operations may be performed on the same EMA when a segmented program is used. One segment can read in data, a second can process it, and a third can store the result. Actual execution speeds depend on how much memory management the user wants to do.

HP 3000 Series 30: Compact computer power

Hewlett-Packard's proprietary silicon-on-sapphire technology has made it possible to introduce a new compact computer system that makes the HP3000 the right business computer family for an even wider range of users and applications.

The newest member of the family is the HP3000 Series 30, an SOS-based processor that performs all the functions of the larger Series 33 and Series III systems, including concurrent transaction processing, batch processing, data communications and program development. It's packaged in a small cabinet measuring only 24" by 36" by 18," accompanied by a separately packaged system/maintenance console and a system disc. Yet it costs under $50,000.

SOS: An HP innovation

HP alone among computer manufacturers has developed SOS to the point where it can be used in commercially available products. For the user, SOS technology translates into small size, low power requirements, and high reliability in a general purpose machine.

The central processor unit (CPU) is designed around three SOS microprocessor chips containing the equivalent of 20,000 MOSFET transistors on one square inch of circuitry. Since devices on an SOS chip are dielectrically isolated, parasitic capacitance is dramatically reduced; the devices may be driven at relatively high speed—typically 2 nanosecond gate delays—on low power.

Putting most of the processor logic on three chips means that fewer integrated circuit packages and fewer printed circuit boards are required for the system. Reducing the number of components directly improves system reliability.

Easy to install

Because of modest power requirements, the Series 30 does not require the classic raised-floor air-conditioned data center. When configured with the standard 20-megabyte disc drive, the Series 30 produces about 4,650 BTUs per hour—about the same amount of heat as a medium-sized copying machine.

I/O flexibility

SOS technology is also implemented in the input/output (I/O) circuitry of the Series 30, allowing for broad expansion of peripherals from a single card cage. Up to 32 asynchronous terminals may be attached, with four magnetic tape drives, eight disc drives (with a maximum of 960 megabytes disc storage), two line printers, and one flexible disc drive.

The Series 30 can now be networked with other members of the HP3000 family through HP's Distributed Systems Network (HP-DSN) architecture. With two communication lines, the Series 30 can configure 24 terminals, 4 magnetic tape drives, 8 disc drives, 2 line printers and 1 flexible disc.

"Hard" and "Soft" MPE

The Series 30 processor maintains compatibility with the proven HP3000 MPE III (Multiprogramming Executive) operating system. Modular design of MPE means that only instructions that are hardware dependent ("hard" MPE, such as Input/Output and clock instructions) need differ on HP3000s that employ different I/O architectures and execution cycle times. The rest of MPE ("soft" MPE) is exactly common code on all of today's HP3000 systems. This allows common higher-level software: language compilers for COBOL, FORTRAN, RPG, SPL, and BASIC; applications tools for data base management (IMAGE/3000); English-like inquiry facility (QUERY/3000); and CRT-based forms management (HP VIEW/3000). Applications developed on any of today's HP3000s can be executed on any other family member without recompiling or relinking.

Thus, the Series 30 provides the business user with a general purpose machine having the same capabilities as the other members of the HP3000 family—the key differences between systems being price* and performance. This computer power can be put where the work is done: as terminals located throughout an organization linked to one computer, or as several computers located throughout the world and connected in a distributed network.

For the HP3000 Family story, **check C on the reply card.**

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*Minimum configurations for HP3000 Series 30, 33 and III begin at $49,750, $58,500 and $105,000, U.S. list, respectively.

Series III
High performance system

- *2Mb memory*
- *16-64 terminals*
- *9 data communication ports*

Series 33
Mid-range system

- *1Mb memory*
- *8-32 terminals*
- *7 data communication ports*

Series 30
New entry level system

- *1Mb memory*
- *4-32 terminals*
- *2 data communication ports*

Where the need for immediate access to information is high but must be provided very economically, the entry level Series 30 is ideal. It can operate as a stand-alone system or as a station in a distributed processing network performing on-line order entry, batch inventory update, new application development and communications.

HP3000 Family

MPE III multiprogramming operating system & utilities

Programming languages

Data base management system

Data base inquiry language

Forms management software

Data communications software

All user-developed application programs

The INP: Housekeeper for busy CPUs

One of our newest SOS products is a front-end Intelligent Network Processor (INP) tailored for communications. Most of the data communications protocol handling is carried out by the INP; thus this load is removed from the CPU.

A data network manager wants programmers or analysts to be able to access remote data quickly, without degrading terminal response time for the rest of the on-line users. INP helps attain this goal by directing the flow of data.

Software off-loaded

The heart of the INP is a silicon-on-sapphire microprocessor, which generates BISYNC protocols from operating system software down-loaded from the CPU when the communications line is opened. The protocols are stored in the INP's own 32K bytes of fast RAM, which is also used for data buffering. This memory, with automatic error detection, is made up of the same chips used in the HP3000's main memory.

Faster response time

When operating, the INP will interrupt the CPU only to report when a block of data has been transferred or received. The chart on this page shows how the INP can reduce CPU overhead; on a system that is heavily CPU-bound, this will result in faster response times at the terminal.

Other factors—I/O activity, amount of memory, number of users, and especially the nature of the particular application—will also affect response time. However, our tests show that on a system with a load of 30 sessions, the INP can reduce the effect of DS/3000 lines on response time by 80 percent.

The INP will also improve the throughput of low-priority background batch jobs.

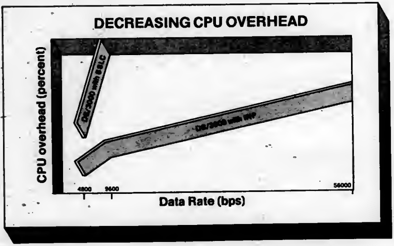
The fact that the protocol driver software is down-loaded from the CPU means that different communications protocols and subsystems may be accommodated in the future without adding new hardware.

The INP will support data transfer rates to 19,200 bits per second using modems, or up to 56,000 bits/second hardwired or with a CCITT V.35 standard interface. In general, maximum data rates depend on the communications subsystem used and the hardware to which the INP is linked.

INP is the preferred data interface for new users of the HP3000 computers. It may be a cost-effective replacement for the present HP SSLC (Synchronous Single Line Controller) on existing systems that are CPU-bound.

Check D on the reply card for further details on the Intelligent Network Processor.

INP outperforms the synchronous single line controller (SSLC) on Distributed Systems 3000, the link to other HP systems.



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IN DEPTH

MAINTENANCE!

The World of Software Maintenance, by Girish Parikh

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A Checklist for Potential Side Effects of a Maintenance Change, by Daniel P. Freedman and Gerald M. Weinberg

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Structured Retrofit, by Jon C. Miller

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Spare Parts Maintenance Strategy, by Tom Gilb

The World Of Software Maintenance

Whether you like maintenance or not, it's a fact of life in data processing. Someone, perhaps you, must do that dirty work — until the mess is cleared and replaced by more maintainable systems developed using structured technologies.

This article focuses on software maintenance as an important part of software engineering. It outlines different aspects of software maintenance and presents a case for collection and development of "software maintenance technologies."

Software engineering, simply defined, is a collection of methodologies, both technical and managerial, for development and maintenance of software. The word "maintenance" is used here in its broadest sense, including error corrections, changes (also called modifications or amendments), enhancements and improvements to the existing software.

The field of software engineering includes technical as well as managerial functions for the equally important functions of software development and software maintenance as shown in the figure.

The two branches (or functions) of software engineering — software development and software maintenance — can also be called "software development engineering" and "software maintenance engineering." However, the shorter terms are already in use, and it appears that their use will continue.

We can further divide software maintenance into "systems software maintenance" and "applications software maintenance." However, in this article, software maintenance includes both.

Software maintenance includes both "structured software maintenance" and "unstructured software maintenance." We will take a closer look at them later.

(The term "unstructured software" is used here to represent the software developed without using structured technologies. However, the qualifying term "unstructured" might be misleading, since there is more of a continuum between the two polar extremes of structured and unstructured, and very little work is *completely* unstructured. The term, though imprecise, is used here, instead of "software developed without using structured technologies," since it seems that it is currently in use to represent such software.)

The articles were excerpted from Techniques of Program and System Maintenance, *edited by Girish Parikh, to be published by Ethnotech, Inc., P.O. Box 6627, Lincoln, Neb. 68506. The 300-page hard-bound book will be available early next year and may be ordered from the publisher for $25.*

Neglected Topic

Traditionally, computing literature has focused on software development. Software maintenance has been largely neglected. This imbalance is like trying to fly with only one wing. (In recent programming literature, however, software maintenance has been receiving increased attention. See, for example, *High Level Cobol Programming*, by Gerald M. Weinberg *et al*, containing a whole chapter on maintenance, and *Techniques of Program Structure and Design* by Edward Yourdon.)

According to one study, about 45% of the overall hardware-software dollar is currently going into software maintenance. The same study further revealed that this number is likely to grow to about 60% by 1985 and is expected to continue to grow for a long time as we add new code to our inventory faster than we discard the old code. The ongoing maintenance, on which most programmers spend 50% — and sometimes 80% — of their time, is clearly a significant burden to users.

The proper use of structured techniques during software development can help produce more maintainable systems and programs, reducing the future burden of software maintenance. Such techniques include structured analysis, structured design and structured programming as well as productivity techniques such as top-down design, walkthroughs and team operations.

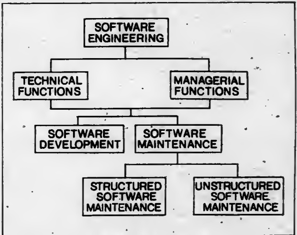
Software maintenance includes maintenance of all software including "structured software" (software developed using structured technologies), as well as "unstructured software" (software developed without using structured technologies).

The maintenance of structured software can be called "structured software maintenance" or simply "structured maintenance." However, the former term is preferable, as the latter is already used in connection with maintenance of unstructured software.

Ideally, structured software maintenance is a process of continued development. However, we do need techniques for structured software maintenance.

The current focus in software engineering is on new systems develop-

(Continued on In Depth/2)



Functions of Software Engineering

IN DEPTH

(Continued from In Depth/1)

ment. The systems developed using the structured technologies need techniques for structured implementation and maintenance. The objectives of these techniques are twofold: 1) minimization of the distinction between testing, integration and installation; and 2) preservation of the structural integrity of the initial systems design while doing maintenance.

The maintenance of unstructured software can be called "unstructured software maintenance" or simple "unstructured maintenance," but the former term is preferable.

Until unstructured software is given a partial or full "face lift" (described later) or is partially or completely rewritten using structured technologies, it may continue to be a major burden. The need for collecting (and even developing) techniques to handle such software maintenance is even greater than that of structured software.

While many techniques may be different for the two kinds of software maintenance, it is likely that some techniques are common to both. For example, the techniques for a face lift can also be applied to structured software.

The maintainability of unstructured software can vary in degrees from easily maintainable to almost unmaintainable. Several factors such as the structure of the unstructured software, the quality of available documentation, the experience and application knowledge of maintenance programmers, the extensiveness and types of maintenance and management's attitude should be considered in estimating the maintainability of software.

Again, maintainability may be relative to the criteria established, and it may vary for different components of the same software package.

Types of Maintenance

Maintenance can be classified into three types: "corrective maintenance" to take care of processing, performance or implementation failures; "adaptive maintenance" to satisfy changes in the processing or data environment; and "perfective maintenance" for enhancing performance or maintainability.

Little has been written on the "how-to" aspects of unstructured software maintenance. Nevertheless, while each such system may have its own problems, some common techniques, based on experience and study, can be collected and/or developed.

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Some of the structured philosophy, such as use of a human librarian, walkthroughs and chief programmer teams, can be applied to maintain unstructured software.

Software 'Face Lifts'

Software "face lift" techniques essentially improve the appearance of software. Reformatting of programs (which can be automated) may dramatically improve maintenance programming productivity.

The restructuring of programs (possibly automated) can also increase maintenance programming productivity; however, it may have limitations depending on the structure of the original software.

Available software packages, such as automated libraries, preprocessors including reformatting packages and structuring engines, file compare utilities and on-line testing and debugging packages, can be efficiently used to increase maintenance programming productivity. This subject needs to be explored.

A Checklist: Potential Side Effects

Over the years, we've accumulated many cases of "side effects" — unanticipated and usually undesired effects that were triggered by changing "just one thing." We've gathered all these things in the checklist given below.

Because the list gathers material from many installations, systems and programming languages, not all items will be applicable to your situation. To use the list, have several knowledgeable people sit down in a review, making sure that they understand each item, that inapplicable items are deleted, that applicable items are tailored to your situation and that any omitted items are added.

Once the list has been tailored to your installation's needs, you may begin to use it in maintenance inspections. Merely inspect the proposed change for each type of side effect in succession. If the change passes this inspection, it's very likely to work correctly the first time on the machine — and not to cause any side effects.

For convenience, the side effects have been divided into four categories: code, data, documentation and miscellaneous. Don't worry too much about classification, though. It doesn't hurt to catch the same problem under two different categories, but it sure hurts to miss it because of a jurisdictional dispute.

Code Side Effects

Generally, code side effects are the most dramatic, though for that reason they may be detected and corrected earlier. Many of these potential side effects can be caught by a good compiler, perhaps with the aid of the linkage editor and/or operating system.

You'll be better off, though, to catch most of them before compiling, since maintenance changes often require huge compilations, within which error or warning messages are often missed.

1. **New error message.** If you do make a compilation, make sure that no new messages are issued and no old ones are changed or deleted unless that was the purpose of the change.

2. **Active label deleted.** The deleted portion of code may have contained a label branched to from elsewhere. Compiler or cross-reference should spot this, but it's an easy manual check to trace back all deleted labels.

3. **Active subroutine deleted.** The deleted portion of code may have contained a performed paragraph or a closed internal subroutine which is executed from elsewhere. This should be caught by compiler if hand check misses it.

4. **Active macro deleted.** The deleted portion of code may have contained a macro definition used to expand code elsewhere. Under some systems, this would not be caught automatically if the name of the macro is a legal default name, leaving code with a valid interpretation of the unexpanded form.

5. **Active label changed.** Instead of deleting a label referenced elsewhere, the change may have placed the label in a slightly different postion, or changed the code following that label which would be executed after a branch to the label. (Note that without GOTOs, these label problems can be controlled.)

6. **Active subroutine changed.** A closed subroutine or executed paragraph invoked from elsewhere may have been changed. The cross-reference list should be used to check for this and the label possibility (point 5).

7. **Active macro changed.** Any change, no matter how slight, to a macro definition can cause arbitrary amounts of trouble if that macro is used in a different context. Cross-reference listings may not identify all places the macro is invoked.

A macro listing from the previous compilation might help — otherwise a hand check of the source code (before macro expansion) must be made. If this list is not available, get a straight listing of the program source code.

8. **Changed function.** Any function whose line of execution passes through the changed statement could be changed. Walk through each different function that passes through the changed code, checking that the input and output state are as they should be in the new code.

9. **Timing relationships.** If the speed of execution changes — either faster or slower — and there are any time-dependent operations, the change could cause you trouble. It's best not to have time-dependent code, but sometimes there's no way out. Remember that it's not just slower code that causes trouble of this type.

10. **Efficiency.** Although the code may be time independent, your budget may not be. All functions that pass through the affected code must be checked for important speed changes that might hurt your computing budget or performance of the entire pro-

gram. Don't just check the function you're changing.

11. Access arm contention. When timing relationships are changed, new files are added or file characteristics are changed, the result can be increased access arm contention on movable arm disk files. The function may be exactly the same, but total elapsed processing time can be raised by huge factors — 100 times or even more.

12. Memory usage. If the change requires more primary storage, it may push that part of the code over its allocated memory, resulting in an error.

13. Memory layout. Even if memory usage decreases, the change may affect the layout of other parts of the program. If the original program was correct and relocatable, this change shouldn't affect it, but the original might not have been entirely correct.

For instance, a data word was uninitialized in the original, but happened to fall on a word left zero by the loader. Deleting one word earlier in the program caused the uninitialized word to be laid over a nonzero word, causing the program to fail. The error was, of course, in the original, but wasn't manifest until the "foolproof" change.

14. Virtual behavior. Any change in core layout, no matter how small, could have an effect on the paging behavior of the program, resulting in a surprising and perhaps unacceptable change in efficiency or elapsed time. For example, pushing just one instruction over a page boundary (and it need not be anywhere near the changes) can double or triple the amount of paging experienced by a program.

So large an effect is rear and unpredictable, so you'd better be prepared to ask if it would be possible and to check for it in the first executions.

15. Invocation count change. Certain subroutines, including system subroutines for handling I/O and other system functions, keep a count of the number of times they are invoked. This count may be used to control messages, priority, system aborts and other functions. If you change the number of times a routine is entered — either increasing or decreasing — the invocation count will change and could cause side effects.

16. Change of priority. In some operating systems, priority can be lowered and/or raised dynamically by the application program or by the operating system if the program behaves in certain ways. Such a priority change could be triggered by a small change in program size or perhaps a change in the pattern of calling some system routines, resulting in vastly altered operating times.

17. File opening. By opening a file at a different point in a program, we may accidentally give a file different characteristics. For instance, in PL/I an implicit opening can be caused by many file operations, with each operation giving different attributes. Explicit opening before first use prevents this problem, but not all programs in maintenance have followed this safe practice.

18. File closing. The program may cause trouble if it closes or causes a file to close that was open previously. This problem cannot be so easily prevented as the file opening problem. It depends, instead, on a discipline of each programmer to avoid any closing before the last possible use.

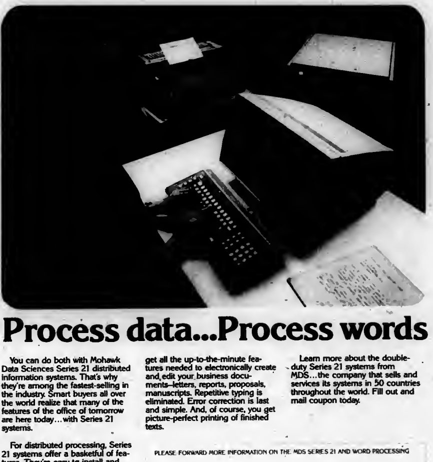
19. On unit change. In PL/I and other languages that provide for interrupts, a program change could change the "active ON UNIT" — that is, the action to be taken in case of a particular interrupt. Such a change could affect any following process that may expect to be interrupted.

20. Interrupt mask change. In systems with interrupts, certain interrupts can be "enabled" and "disabled" by program action. If a change modifies the "mask" governing enabling and disabling, any subsequent process can be affected. There can be an interrupt which was previously disabled, or a previously enabled interrupt may not be "masked."

Data side effects can be very subtle and related to the actual change in the most oblique ways. Many data side effects lie unnoticed for weeks or months after a change, until some user gets a funny feeling about what's happening to the output. The savings to be gained from finding data side effects in a review before they happen are, therefore, potentially enormous.

1. Flag change. If the change modifies the state of a flag, or deletes the

(Continued on In Depth/4)



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IN DEPTH

(Continued from In Depth/3)

modification of a previously modified flag, or changes the conditions under which a flag is modified, any part of the program that accesses that flag could be affected.

2. Condition change. In languages such as Cobol which have named conditions, changing a data item's value could change a condition which doesn't seem to have any obvious relationship, according to its name. Check all conditions that are based on any data item changed by the program.

3. Data value change. Any time a data item is used in more than one place, any change to that item could cause problems with any process that accesses it. Use the cross-reference listing to indicate potentially changed processes.

4. Changed allocation. When dynamic storage allocation is used, any change that allocates or deallocates storage could affect another part of the program.

For instance, if an extra item is put on a stack, the stack count in other places could be out of synchronization, perhaps leaving one item unprocessed. If an item is deleted, a system error might result when the stack empties too soon. Also, the total allocation might become too large, dynamically, if additional allocations are made by the changed code.

5. Overlay change. When various data areas are overlaid, the chances for side effects escalate. Avoid overlaying whenever possible. Where it must be done, or has been done, check each and every name under which the same storage can be accessed or changed.

6. Parameter change. If a subroutine is changed, and if that subroutine now changes some parameter passed to it by reference, the calling routine can be devastated.

In Fortran, for instance, the called routine can even change "constants." Search out all references to parameters and eliminate such changes if possible, but be sure to check out all that can't be eliminated.

7. File position change. If a sequential file is read or written, or was formerly read or written, by the changed code, any change in the number of reads or writes, or in any other file positioning actions, could disturb the behavior of other regions of code. Even on a print file, an extra line could cause disruption of line counts or break up a previously contiguous group of output lines.

8. Invalid pointer. Whenever data structures are linked together by pointers, certain operations on the pointer itself are not, of course, side effects, but operations on the referenced material may affect the pointer in hidden ways. If the number of items in a table is changed, the pointer to the last element may not be updated, or the table count may not reflect the change. Even moving an item, within core or back and forth to a backing store, can render pointers invalid.

9. Record layout changes. Expanding, contracting or deleting a field in a record can change the definitions of other fields, which in turn can disrupt other programs that reference those fields or other parts of the same program.

In higher level languages, recompilations may be required, but these do not always automatically correct the problem. In some data base systems, the change of physical record layout is "transparent" to the user programs — except for possible efficiency considerations or bugs in the data base system.

10. Security alterations. In some operating systems, files and data bases can be protected with some access control scheme. If the scheme is dynamic, any change to the security level or interlock pattern could have effects on other portions of the same portion or on other programs operating in parallel.

Documentation Side Effects

Probably the most frequent side effect of maintenance changes is the corruption of the existing documentation. The programs change and yet the documentation remains the same. Even when an effort is made to update the documentation, subtle points are overlooked in the rush to production.

Eventually, the accumulation of small errors in the documentation produces documents nobody can rely on. After that, nothing short of a major effort to rewrite can restore the documentation to usefulness. Only by systematic review of the impact of each change on all documentation can we keep the documentation current and useful.

1. New name. When a new data name, file name or label is created, it must be posted to all reference lists. The newest names are the ones most likely to be sought in the documentation, yet are the least likely to be found there.

2. Old name deleted. When an old name is no longer used, it should be deleted from all appearances in the documentation. If the documents are not well indexed, it may prove difficult to locate all references. Eventually, old names accumulate in a document, cause confusion and slow down the use of that document.

An excellent practice is to create a section of the document called "formerly used names." These names are kept in the index as well so that anyone running across a leftover name can immediately find out that the name is no longer in use. The list of formerly used names can also be helpful in avoiding the use of names recently in use, which may prove confusing.

3. Invalid index. When pages are added to or deleted from a document, the index may be rendered invalid. Without automatic production of the index which updates all later page references, such an index becomes worse than useless. It becomes misleading.

One method of keeping the index valid is to use fractional page numbers for inserts. This postpones the problem of updating the index until the pages are renumbered but then makes the job practically impossible without starting over. Also, any indexable items in the insert must be referenced — to the fractional page numbers.

This kind of updating seems, at the time, to be a real pain in the neck, but if you aren't going to do it, then get rid of the document altogether.

4. Invalid table of contents. When sections are added or deleted, the table of contents become invalid. Usually, all this requires is a retyping of a page or two. Don't make the mistake, however, of thinking that the table of contents is the only reference list that must be updated. In general, especially for large documents, the index is a far more important starting point for information searches.

5. New message error. Of all the error messages, the newest are the ones most likely to be encountered in all use of the system, yet they are the least likely to be found in the message reference manual. "Self-documenting messages" are one solution to this problem, but few systems are willing to devote sufficient storage or time to make messages truly self-documenting.

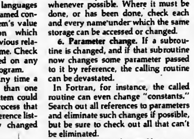
The best way to make sure that messages get into the message documentation is to have an automatic way of updating that documentation. Even then, the reviewers need to check that the programmer has taken the trouble to activate the update.

6. Deleted message error. It's not usually too serious if we forget to delete the documentation for a deleted error message. Nevertheless, it's good to keep things tidy and to prevent the documentation from growing too large. Also, keep a list of previous error messages so they won't be reused. There often are copies of documentation lying around which would give a user the wrong interpretation of the new message under the old name.

7. Error message meaning changed. Old copies of documentation make it very difficult to "spread the word" when an existing message changes meaning, even if the master documentation is updated.

The review group will want to question any change of meaning or addition of new meaning to an existing error message. Usually it's best to create a new message to handle the new case. Any cost in machine resources is quickly recovered by benefiting the otherwise puzzled users.

8. Operator response changes. All the same arguments we've given about error messages apply to operator responses. In addition, if new operator



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responses give the operator more power, it's usually a good idea to provide training. Otherwise, the operators tend to continue as always, ignoring the new and improved ways of doing things. The review group should ask, "How will the operators learn to use these new features?"

9. **Accepts new data.** When input routines are modified to be more forgiving or to accept previously forbidden forms of input, failure to document and train can wipe out the value of the changes. The review group must once again ask, "How are these new features communicated to the people who prepare the input?"

10. **Rejects old data.** When acceptable ranges of input are narrowed, the users will ordinarily find out, even if the changes are not documented, when they try to use previously acceptable inputs. Nevertheless, their attempts to get the system to accept this data will prove costly and annoying unless they are informed in advance of the changes.

11. **New data interpretation.** When previously acceptable input is now accepted under a different interpretation, users will make costly mistakes unless they are most carefully and thoroughly prepared for the changes. It will generally be best for the review group to question a design that changes the interpretation of existing inputs, rather than incur the costs of dumping such a design on the users, no matter how carefully they are prepared.

Miscellaneous Side Effects

Rather than debating the classification of a particular side effect you encounter, add it to this list of miscellaneous side effects.

1. **Clerical procedures.** Take the time to review what effects will result before and after the computer portion of the processing. For instance, incorporating more information in a report may eliminate or change clerical operations that previously had to be performed before the former report was used. Although these shortcuts may seem completely advantageous, any changes in clerical procedures can initially be expected to lead to errors unless specific provision is made to retain those people performing the operations.

2. **Forms.** Changes may require new forms or new interpretations of old ones. In the first case, form printing may be the longest lead time item in the design — and the existence of a five-year supply of old forms may generate resistence to the new system. In both cases, the review group had better check that the system will provide some information along with the first new ouputs, so that users understand the new material.

3. **Impact on other systems.** In one case, a maintenance change increased the amount of six-part output from an insignificant few pages to a major portion of the inventory. When it came to run the other systems using six-part paper, the stock was quickly depleted.

There's no end to such subtle effects and no way to guarantee that all of them are caught in a review. It never hurts, though, for the review group to take a few minutes and brainstorm regarding what areas may have been overlooked. Keep track of all cases that occur, and eventually you'll have a pretty effective checklist, including such itens as:

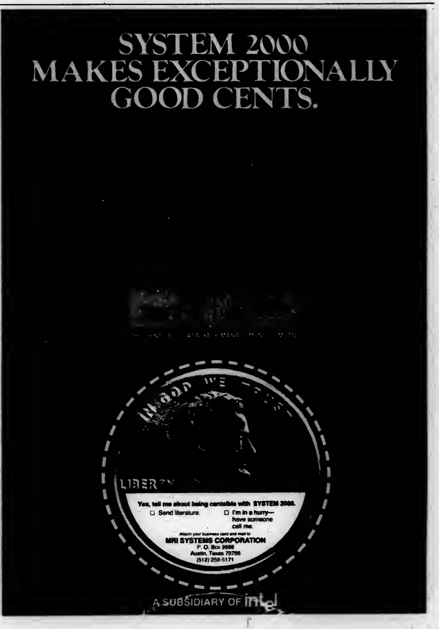
- Use of a shared forms inventory.
- Shared forms resources.
- Skilled personnel needed by two systems.
- Scheduling conflicts.
- Telephone or communications line loading.
- Exclusive use of lines.
- Competition for auxiliary equipment or services, such as bursters, delivery carts and storage space.

4. **Job control.** Many program changes require associated job control changes. Such changes are obviously part of the "side effects" of any maintenance change. Less obvious are the changes that make the job control procedures less efficient, though still valid.

The review group must check that the previous job control is still the best for the modified system. Will there be inefficiencies? Will operating procedures become less convenient? Can we take advantage of the change to bring the system more in line with present operational standards or with newly available equipment?

5. **Expectations.** One of the most

(Continued on In Depth/6)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(Continued from In Depth/5)

frequently overlooked side effects is the effect of a modification on what people think. The announcement of a change may make the users prepare themselves (perhaps wisely) for a rash of errors. On the other hand, the announcement of one change may lead them (foolishly) to expect that other changes will naturally accompany it or soon follow.

The net result of an "improvement" is often a mob of even less satisfied users, so the review group ought to speculate on what will happen when this change encounters the wooly world of the human psyche.

6. Success. In the past, maintenance has been so fraught with side effect dangers and just plain errors that success was seldom achieved. Once our maintenance reviews are in full swing, however, we have to anticipate that we will in fact succeed once in a while — and we must also anticipate what that success will bring.

For instance, one error-riddled system was seldom used by its several hundred potential users, so management decided to mount an effort to have the system repaired in a systematic fashion. The resulting system was so dependable and useful that usage suddenly increased by a factor of 1,000 over previous usage. This increase in transaction volume made the file design of the system completely inadequate to the daily load — which soon meant that nobody could get results fast enough to be useful.

The entire problem and so many others like it could have been avoided if the review group had only considered that unavoidable law of nature: success breeds failure. So, just when your maintenance reviews start to pay off, be prepared for the inevitable reaction. If you start making systems better, your users will want more of the same — the best side effect of all.

Structured Retrofit

The structured methodologies are now fairly well accepted for new systems development, although there are differences in interpretation from installation to installation. Their use has rarely been considered, and almost never accepted, in a maintenance environment. "Structured retrofit" is the application of today's methodologies to yesterday's systems in order to support tomorrow's requirements.

The typical DP department spends more than half its staff on maintenance coding, maintenance compilations and maintenance testing. What is needed is a departmental strategy which improves the probablities of: quick satisfaction of random requests for maintenance, reduction in the number of programs designated incapable of cost-effective maintenance and increases in the numbers of programs capable of supporting major enhancements without rewrites and extensive testing.

Consider creating a task force using the following elements in a maintenance support capacity:

- A chief programmer.
- A librarian and development support libraries.
- Programmer/analysts.
- Top-down design.
- Structured walk throughs.
- Structured programming.

The chief programmer leads the task force in seeking out candidate systems for structured retrofit. In advance, the team must have some scoring system for rating candidates.

The system should include both subjective input from users and managers and objective data from the program's log. In this latter category, include the age of the program, the number of changes applied since its inception and the time since last changed.

Each team member conducts some research and presents the results to task force members in a walk through fashion, as a basis for proceeding on program changes. Once the high-payoff candidates have been identified, the team members proceed to the next level of research, to be followed by another walk through before making any changes to program code.

Priorities for Change

The priorities for changes within a program are:

1. Standardization of visual properties (indentation, naming conventions and paragraph prefixing, in particular).
2. Use of libraries for interprogram communication (principally for record formats and standard formulas and algorithms).
3. Isolation of I/O routines, with record counts, from in-line processing to one PERFORMable routine per file.
4. Elimination of PERFORM, GO-TO and ALTER ambiguities, uncertainties and control pathology.
5. Elimination of overlapping PERFORM THRUs and restriction of any residual THRUs to EXIT paragraphs.
6. Optimization (mechanically) of compiled code to improve program throughput.
7. Flowcharting (mechanically).

The validation mechanism is a file-to-file compare utility, which may be applied at any time. There is no need to complete all retrofit items, but merely to proceed as far as is cost-effective and time-effective. The methodology allows for resumption of retrofit activities at any time that its score on the priority system rises, from information supplied outside the task force.

There is one cardinal restriction: No member of the task force is authorized to make any change to eliminate any revealed error or to satisfy a request for program enhancement. This restriction eliminates time lost to user negotiation and ensures that there is always a fall-back point, should the file-to-file compare utility reveal any insoluble problem. It also protects the user from losing an audit trail. The task force members do, of course, record any apparent bugs for review and authorized correction by the normal maintenance group.

The librarian, as in a development team, is the focal point of proven

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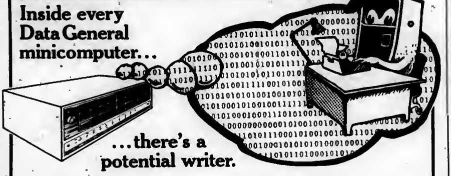

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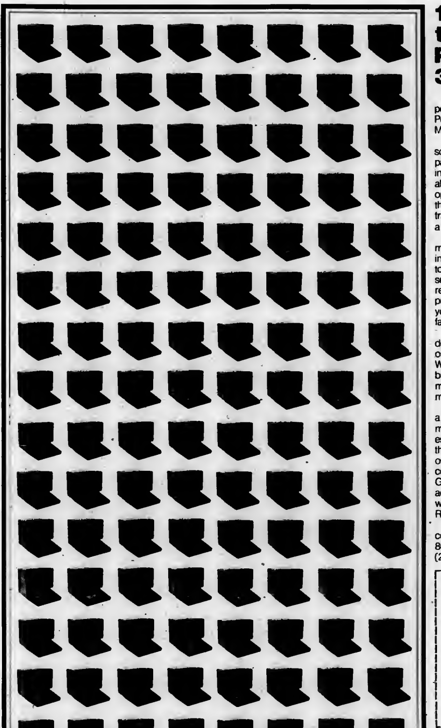

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(Continued from In Depth/6)

achievement, controlling the retrofit log, the test data used to validate the retrofit and the mechanized documentation (library materials, flowcharts and program listings). All migrate back to the normal maintenance area. The librarian may also have the task of researching the literature and marketing materials to find tools to speed up the retrofit activity.

This article merely introduces the idea of a task force in a maintenance support function. It offers no objective data to support its position. However, I contend that existing software packages (library systems, convention-enforcing programs, the SORT verb, report writers, structuring engines and object code optimizers as well as flowcharters) provide adequate tools for cost-effective retrofit.

In closing, simply consider the potential savings from extending the mean time between conversion by months, years or even decades by having code which can be reliably modified instead of scrapped. Remember that most code scrapped covers conditions undocumented in the old system and forgotten in the specifications for its successor.

Spare Parts Maintenance Strategy

You are responsible for the on-line project or its maintenance. When the inevitable system breakdowns occur because of program bugs, you know that it is important to all users of the system that the programming team can diagnose the source of the error, correct it and retest the entire system. Then, at the end of two to 20 hours, with luck, you can put the "real-time" system back on the air again. With the best available technology and a lot of luck, this will only happen once a week or once a month.

I know this will sound incredible, but I recently received technical papers from software specialists who are responsible for the safety system of atomic power plants. They clearly thought that the solution to their reliability and maintenance problems was through structured programming. Antipollution forces take note!

Needless to say, in panic (my own life was at stake) I offered to visit them at my own expense and set them straight. I am much relieved to say they accepted, and part of what I told them is the idea below.

The basic idea is very simple. Write two programs to perform the *same* function. One acts as a spare part for the other. The basic assumption is that both are well tested and that whenever a bug does occur in one of the program versions, then exactly the same bug will not usually be present in the spare-part version.

We do this with computer hardware and with the software known as "files," and if you think about it, we have actually been practicing this technology on a wide scale with programs for years. You don't believe me, do you?

Think about what a systems programmer does when he unexpectedly encounters a bug in the new update of the supplier's software. He goes back to the spare part with different bugs, the old version. Similarly, when converting to new programming languages on the same system, we are naturally prepared to revert to the old version (even if it does run slower and

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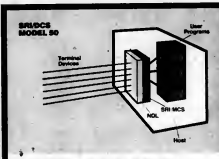

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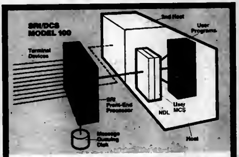

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is less portable) when we hit unexpected bugs on the recently coded version.

So in fact, what I am talking about is making conscious use of the concept of spare part programs when planning a new system. The most immediate objection is cost. However, before yoo discard the idea on cost grounds, ask yourself whether the dual computer systems you have planned (for graceful degradation to one of the CPUs when the other fails) is really well planned.

Half the breakdown causes are related to hardware, but half of them are from software, including user-written programs. Is it really consistent economics to buy hardware spares and not to buy software spares? The myth that programs don't break down ("once they are right") — and therefore need no spare parts — is difficult to break down, because the people who believe it have not been listening to the widespread experience in the software field which tell their clear story.

Software is as error-prone as hardware. There is no known way of guaranteeing error-free software which is practical, and in any case, a spare part is much cheaper than a perfect program. Two Volkswagens are probably a more reliable transport alternative than one Rolls Royce — and a lot cheaper.

For some real-time on-line installations, particularly the ones who feel they can afford to have a mostly idle standby computer, even a doubling of the application coding cost would be an acceptable increase in the project budget if it resulted in almost immediate repair of software faults using the spare-part method.

Fortunately for the rest of us, there is good reason to believe we can afford the spare-part software too. Experience plays surprising tricks on our intuition. Would you believe that writing two programs can be cheaper than writing one of them? That is the experience of a large number of those who have tried.

And even when it hasn't been cheaper, there are reports of "only 10% more." The reason is that dual but distinct software can be used in a variety of ways to reduce the total cost of software production and maintenance, so that the effort of coding it twice (coding being only 5% to 10% of a real-time project, anyway) may be a profitable investment.

One example is the kind of thing that Rault of Thomson-CSF in Paris has practiced. He codes electronic design programs in APL, as a cheap model (one tenth the cost of Fortran) and then recodes, from the model as a plan, in Fortran, to get a program with one tenth of the operational cost.

In order to test the system, he feeds the same inputs into both "models" and checks to see if they produce the same outputs. This amounts to automating the desk checking and automating manual validation of test cases.

If you are planning on thorough testing, this results in a considerable saving of human time, which more than pays for the APL model. The APL model was already paid for since it replaced flowcharts and nonmachine-readable pseudocode.

Readers are invited to comment on the material presented here, or the techniques they have developed to cope with the maintenance problem, by writing to Parikh at Shetal Enterprises, 1787B W. Touhy, Chicago, Ill. 60626.

Girish Parikh is president of Shetal Enterprises in Chicago.

Daniel P. Freedman is president of Ethnotech, Inc., and Gerald M. Weinberg is chief scientist at Ethnotech.

Jon C. Miller is president of Catalyst Corp., Chicago.

Tom Gilb is an independent consultant based in Kolbotn, Norway.

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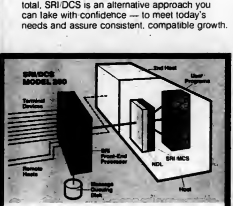

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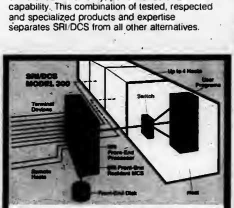

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A New Breed of Service

Disaster Recovery Centers Springing Up

By John Whitmarsh
CW Staff

Fire. Flood. Explosion. Sabotage.

The possibilities are remote, but computer disasters do happen. And the more a company depends on its computer, the greater its business vulnerability.

For companies in which computer downtime over an extended period would mean significant financial loss, a new breed of service company has sprung up to help.

Specializing in computer back-up and recovery services, these companies stand ready to supply computer time or facilities space or both in the event of a computer disaster.

Such assistance is not free. Recovery services are available only to subscribers, and subscription usually involves a written contract covering one to seven years and annual premiums from $12,000 to $50,000. Sound like an insurance policy? Exactly.

Two companies now provide backup and recovery services. A third tried to crack the market but went bust before it opened for business (see Page 57).

Contracting with a commercial company is not the only way to enlist recovery help. Some DP departments are joining forces in cooperative efforts, which may be less expensive but usually provide less immediate support.

Facilities range from barebones to fully-equipped, and prices vary accordingly (see chart). But for the business that cannot live without its computer system, such disaster insurance is one answer.

	SUN INFORMATION SERVICES CO.	DATA PROCE[illegible] SECURITY, INC.	[illegible] CO.
Facility	Fully operational computer center	Off-site recovery operations center	Off-site recovery operations center
Size (sq. ft.)	28,000 total 15,000 raised	50,000 total 16,000 raised	8,000 total 4,000 raised
Installed Hardware	IBM 3033 (8M bytes) Full peripherals	IBM 3705 controller plus other long lead items	None
Capacity	Two IBM 3033s One IBM 3031	Three IBM 3033s	Two IBM 3033s
Corporate Members	60 maximum	35-100 per recovery operations center	18 maximum
Installed Power	Not available	600 kVA 60 Hz 225 kVA 415 Hz	665 kVA 415 Hz
Installed Air Conditioning	170 tons	160 tons	81 tons
Fire Protection	Halon gas	Halon gas	Hand-operated fire extinguishers
Security System	24-hour guards Card-key access Closed-circuit TV	Card-key access Badge readers Closed-circuit TV Water detection system	Unoccupied building alarm system
Telephone Lines	900 voice-grade	900 voice-grade	10 voice-grade
Uninterruptible Power System	Space provided	Space provided	None
Motorgenerators	Two	Space provided	Two
Availability	Within 4 hours	Within 43 hours	Within 24 hours
Contract Length	One year	Seven years	Three years plus automatic annual renewal
Cost	IBM 3031: $2,500/mo IBM 3033: $4,000/mo	$1,000/mo	$1,000/mo*
Usage Fee	$4,500/day	75¢/sq. ft./mo	$500/day (30-day minimum)
Notification Fee	Within 4 hours: $50,000 Within 8 hours: $45,000 Within 12 hours: $40,000 Within 24 hours: $25,000	None	None
Extra Charges	Utilities included; communications extra	Utilities and general expenses; optional security	Utilities and general expenses; optional security

*CW estimate

Three Options for Users

A Natural Choice

"Our company could be seriously hurt if our computer facilities were destroyed and we were not able to process for any considerable length of time," James McGrath, director of DP services at Pennwalt Corp. in Philadelphia, said.

"We have a responsibility to our stockholders to run the business even if we have a computer disaster. And as we use computers more, it becomes harder to do without some sort of backup arrangement."

Last January, McGrath signed for the Sungard protection package introduced by Sun Information Services Co. of Philadelphia. McGrath wanted to protect his IBM 3031 and 2M bytes of memory plus the expansions he was planning for late this year.

Sun has a fully operational computer center dedicated to backup capability, complete with an IBM 3033 and 8M bytes of memory, all peripherals and a fully prepared computer room. For McGrath, it was a natural choice.

"Frankly, we had been doing some things to protect our computer that we no longer have to do. Sungard is not an awfully lot

(Continued on Page 56)

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New Breed of Service Offers Disaster Recovery

(Continued from Page 55)

more expensive than what we were doing before. I look on it as an insurance policy. And I think it is worth the premium," he said.

Another large systems user, and Sungard subscriber, Connecticut General Life Insurance Co. of Hartford, operates an .8M-byte IBM 3033 and will soon add a second 3033.

"I felt Sungard could handle our critical applications in an emergency," said James G. Loughran, secretary of corporate data processing, when asked why he chose Sungard.

Connecticut General signed a two-year contract that is renewable up to five years, Loughran said. The monthly premium is $4,000, and the contract is renewable at the same rate.

No Disasters Yet

Thirty-six companies have signed up for Sungard protection since the company opened its recovery site last January. The maximum membership is 80 companies, according to Robert J. Bogle, director of Sungard services.

Sun Information Services plans three additional sites, one more in the Philadelphia area and two others in undisclosed locations.

To date, no company has used the center because of a major disaster. However, several clients have taken advantage of its services for operational backup or development work.

"Those clients use sufficient quantities of time to offset their monthly fee," Bogle explained. "So the center is truly dedicated to backup — both operational and disaster backup."

Bogle claims the need for disaster recovery centers arose because of the deficiencies in reciprocal agreements, which rely on trading CPU time. "Reciprocal agreements aren't worth the paper they're written on," he snorted. "If a DP manager is running his data center prudently, then he doesn't have idle capacity. And he cannot expect anybody else to have idle capacity."

Latest Entry

The latest entry into the disaster recovery market is Data Processing Security, Inc. (DPS) of Fort Worth, Texas.

DPS opened its first recovery operations center (ROC), a $3.2 million facility, in Fort Worth last month. The pre-engineered 50,000 sq-ft site can accommodate three IBM 3033s and houses voice and data communications links, power supplies, air conditioning, raised flooring and security and fire protection equipment.

Unlike a Sungard member, the DPS subscriber must supply his own computer, and DPS executives claim manufacturers can supply equipment to the site in a matter of hours.

"In a test run with IBM, in 30 hours and 45 minutes we had a complete, fully equipped 370/158 with 8M bytes of memory all prepared for shipment to the ROC," DPS President Louis Scoma recalled. "We estimated that it would require another two to three days to have the system fully operational by working around the clock with [IBM's] facility engineers."

The cost of membership in DPS is $1,000/mo.

DPS plans ROCs in five other cities plus four more ROCs strictly for government and Department of Defense use, Scoma said.

Each ROC will be large enough to accommodate the essential computer configurations of up to three corporate members at once. Because of the chance of simultaneous disasters, Scoma explained, only six member companies in any one ROC may be located within a half-mile radius of each other.

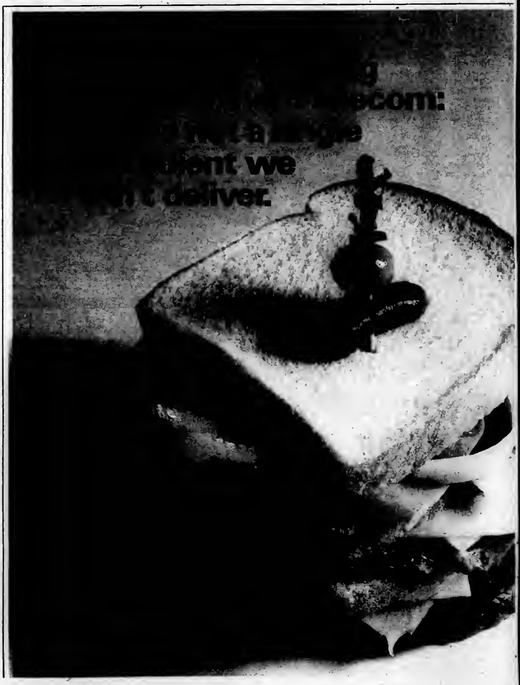
Cooperative Ventures

Some companies that consider reciprocal agreements inadequate yet do not want to subscribe to a commercial recovery service have opted for cooperative ventures.

In Cincinnati, Western & Southern Life Insurance Co. will open a recovery operations center in a vacant supermarket next month. The center is owned by Western & Southern, but is supported by 12 other local companies.

The 8,000 sq-ft facility has the necessary air conditioning, power, chilled water unit, mo-

(Continued on Page 57)



Users Believe 'It Won't Happen to Me'

Anatomy of a Failure: Market Wasn't There

By John Whitmarsh
CW Staff

KING OF PRUSSIA, Pa. — A company set up to sell computer disaster recovery services announced recently that it was closing its doors even before it opened them for business.

Shared Standby Systems planned to convert a vacated DP center to a recovery operations center that would sell computer time and facilities space to companies whose systems crashed.

The plan flopped.

How could a company designed to help others recover from disaster fail to save itself? "The critical mass was not there," explained James Carter, general manager of Shared Standby Systems, a subsidiary of Shared Medical Systems Corp. Shared Medical is an $80 million service bureau handling on-line computing needs for the health care industry.

"If you don't have 30 or 35 members signed up when you open the doors, it's a losing proposition. We tested the market and felt it was not strong enough for us to enter."

Shared Standby reportedly signed up only 18 of the 35 customers it needed to break even.

Idea Marketable

The idea behind Shared Standby seemed marketable. Large corporations depend so heavily on computer systems that they cannot afford to be without them.

Such companies, the theory goes, will pay handsomely to ensure the availability of a backup system in the event of a major computer disaster.

Reciprocal agreements between companies to share computer time work only when the backup company has machine time to spare. But with computers running flat out for five, six and seven days a week, spare CPU time is becoming harder to scrounge. Hence, the birth of a new market and the appearance of independent companies like Shared Standby that would sell computer time and facilities.

The theory had a flaw: most people believe disaster happens only to the other guy.

(Continued on Page 61)

New Service Springs Up

(Continued from Page 56)

torgenerators, raise flooring and supporting space to handle the IBM 370/168 Attached Processor with 6M bytes of memory "and a lot of iron hung on it" that Western & Southern uses in its active shop, according to F. Thomas Schneider, second vice-president and director of the DP operations department.

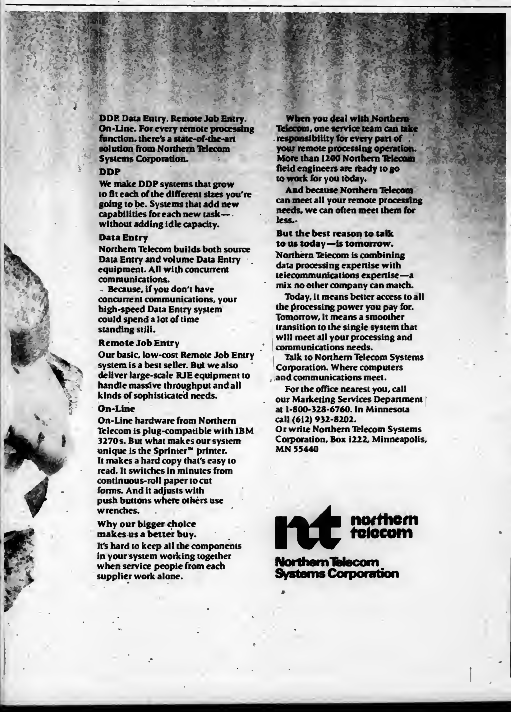
In the event of a disaster, Western & Southern or any other member of the co-op that takes over the backup facility must contract for and install all its own equipment.

"It would take us 21 to 23 days to get back up and running in the backup facility," Schneider said. "Based on vendor performance records, we could probably do it in less than that. Vendors have assured us they could provide backup equipment very quickly, and they stand on their records."

The cost of membership in the co-op is about $1,000/mo which, Schneider said, assures availability of the site while providing some comfort to worried DP managers.

"That $1,000 fee is nothing more than an insurance premium," he added. "For the cost of one clerk, or about $12,000 per year, a company can have an emergency backup facility in the event of disaster. No one has balked at the cost."

Reciprocal agreements are of little value, Schneider agreed. "The day of the reciprocal agreement is gone. The reason is that most systems today are hybrids, uniquely designed to an individual company's needs. I think we'll see more of these ventures in the future."



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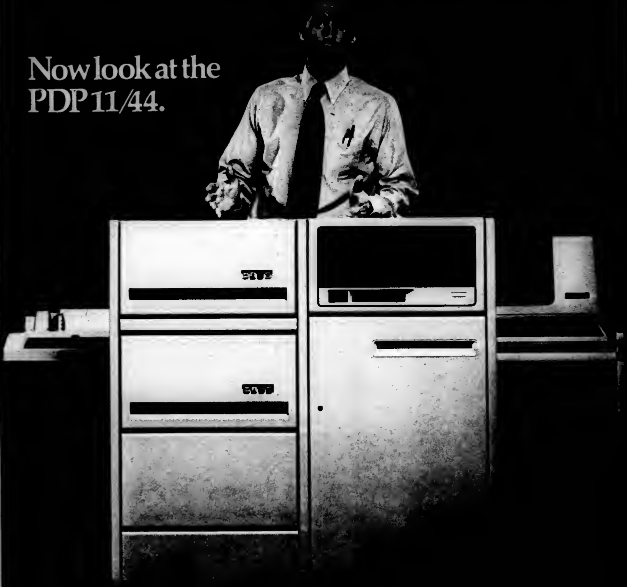

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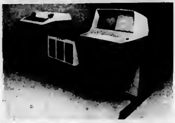

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Seated at left, Trenholm Turner, manger of systems and programming for J.L. Rivers and Co., leads Ceta students through hands-on programming exercises.

Student Interest Quadruples When DP Training School Moves to Different System

By Marguerite Zientara
CW Staff

BOSTON — Costs plunged from $7.27 to $1.55 per compile and student interest quadrupled when a minority-oriented DP training school here switched frum an IBM System/3 to a Datapoint Corp. Attached Resource Computer (ARC) for its leased training equipment.

Founded in 1975 and incorporated in 1977 to develop DP employment opportunities fur blacks, women and other minority and ethnic groups, J.L. Rivers and Co. (JLR) started out with a machine that allowed only one compile per student per day, according to Joseph L. Rivers, the school's founder and president.

With about 30 students in each course of study, all sharing a single terminal, the situtatiun left a lot of people waiting around for a chance to do some hands-on work. After almost a year uf uperating under such conditions, JLR started shopping around for a system that could give it better throughput for a reasonable price, according to Tremholm Turner, the school's manager of systems and programming.

The school's management examined equipment from Wang Laboratories, Inc., Data General Corp. and Digital Equipment Corp. as well as IBM and Datapoint, looking for hardware with "unrestricted growth capability, flexibility, easily learned programming and operating techniques and with real-time, on-line, functional business data processing," Rivers recalled.

JLR chose Datapoint's ARC system — which allows each student to run up to six compiler prugrams per day — because of "its price, all the hardware we could get with it and because it adequately filled our jobs," Turner said.

With an estimated 80% of a student's work consisting of data entry and the uther 20% consisting of compiling and executing, the ARC system has the special advantage of allowing several students to do on-line and data entry work while others are compiling. "Our student interest quadrupled as they were able to work together as teams on projects and see results within minutes instead of hours," Rivers said.

Each ARC system uses common peripherals and software. The only fundamental difference between the systems is the number and size of the processors and disks, according to a Datapoint spokesman.

In JLR's case, there are four Model 3800 processors and three Model 6000 processors for a total of 512K bytes of main memory. Disk storage amounts to 20M bytes, with another 100M bytes soon to be added.

The dispersed processing concept is easy for students to grasp, Datapoint claimed, and offers a solution to the prublem of how to implement a cost-effective system that can grow without a complete redesign.

Proof of that concept lies in the fact that the school is about to add another Model 6000 processor for an additional 120K bytes of memory. Also included in JLR's configuration are 10 Datapoint 3600 CRT terminals, one 300 line/min printer, one 80 char./sec printer and a soon-to-be-added 150 line/min printer.

Aimed at providing its students with "a firm grounding in the principles and techniques of the computer field," Rivers said, the school gives each student a core understanding of computer language, computer hardware and cumputer systems.

The curriculum makes intensive use of specific cases that give students the upportunity to apply their knowledge of DP principles toward solving a variety uf business problems by recreating the working environment of an on-the-job DP professional, Rivers said.

Tu round out its program, which operates under a Comprehensive Employment and Training Act (Ceta) contract, JLR includes achievement counseling designed to reinforce the student's ability to succeed in the business world. Such ideas often have not been developed because of minorities' typical exclusion from the "mainstream" for most of their lives, Rivers said.

Recovery Center Shuts Down Before It Opens

(Continued from Page 57)

"The big problem was generating a customer base, trying to convince people that they needed backup," Carter said. "People don't need backup until something happens. That is the mentality that exists in the DP industry. They wait for something to happen.

"It's like selling a ticket to the moon. Most people wait until the first flight takes off before they buy a ticket."

Shared Standby thinks it may have been ahead of its time. "I think we were a year too soon," Serge Rebenkoff, national marketing manager for the defunct company, said. "The need for our services will grow with the industry, but right now it's a little early."

Potential customers expressed considerable interest in the backup service, Rebenkoff said, "and things were moving in our direction, but we couldn't wait for the market to swing around."

Critical Mistake

Rebenkoff figures the company made a number of critical mistakes.

First, the marketing team misjudged the closing cycle. "We anticipated that the time from initial contact with a customer to a written contract would be under six months," Rebenkoff said. "We found the average closing cycle was six to nine months."

Second, Shared Standby was selling an intangible item. Management expressed polite interest, but would not put money where its mouth was.

Most companies opted to invest in tangible assets rather than bet on unforeseen disaster, Shared Standby learned. "It's part of the 'it won't happen to me' syndrome," Rebenkoff said.

Ironically, the backup service cost less than new hardware. Rebenkoff said his service would have required a financial commitment of $50,000 to $60,000 over a one- to five-year period, but "management prefers to put the dollars into another data center, even though our services cost nowhere near the same as a new facility."

The idea for a backup service grew out of a system upgrade at Shared Medical Systems. The company was moving to a new multimillion dollar DP center and figured it could defray the cost of maintaining two DP sites by sharing the old one with other companies.

That, in fact, seems to have been Shared Standby's third mistake. The company failed to convince potential members of its financial commitment to the business.

"I got the impression that Shared Standby was trying to subsidize its own backup site as opposed to being committed to the recovery concept as a profit-making venture," commented one DP manager who eventually signed with the competition.

The concept crystallized 18 months ago. In that time Shared Standby signed up only 18 customers, though Rebenkoff claims to have letters of intent and commitments from twice that number.

Shared Standby calculated its own costs to maintain the recovery operations center with an IBM 3033 in place at $200,000/mo.

Users of the center were to be charged by the size of their installation. Customers requiring only half the 3033's capacity would pay $3,500/mo; larger customers needing full use of the machine would pay $5,500/mo. All members would sign a five-year contract, and the only additional charge would be a $4,500 daily use fee in the event a customer suffered a disaster and actually moved his operations into the center.

But the cost structure broke down under the pressure of competition. One competitor offered shorter contracts aimed at smaller users. Shared Systems responded. with three-year contracts and quarter-machine increments and apportioned prices. But the numbers failed to add up.

Meanwhile, the time to make a commitment to open the center was drawing close.

"We had to open in the last quarter of this year," Rebenkoff said. But with only 18 customers signed up, the company projected its losses for the first 18 months of operation at $1 million.

Six weeks ago, Shared Standby canceled its agreements with its 18 customers.

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Service Bureau Just Too Slow

Apparel Maker Buys CPU, Tucks in $100,000

By Marguerite Zientara
CW Staff

SAN FRANCISCO — A sportswear manufacturer here said it is saving more than $100,000 a year in clerical labor and invoicing expenses, as well as speeding up order processing, after going from a service bureau to an in-house mainframe.

Part of an industry that has become so complex and unpredictable that even the most intuitive merchandisers find they must base marketing decisions on information provided by an efficient computer system, Fritzi of California first utilized a Los Angeles-based service bureau to fill its need for current data.

In 1974, the firm's sales were in the $20 million range and the service bureau was adequate for its needs. Orders were batch-processed from data that was keypunched in Fritzi's DP department here.

The information was used to produce various sales reports, picking tickets and invoices and a bill of materials explosion for piece goods requirements.

Turnaround Too Slow

However, by the end of 1975 Fritzi's sales had reached $38 million. The company began to have serious problems in order processing, production planning and accounting.

"One of the major problems was the slow turnaround time involved in sending data to Los Angeles and waiting for processed material to be returned," Lew Jenkins, vice-president of management services, recalled. "At best, it would take five or six days for us to get our sales reports back."

With more than 500 styles of clothing in production, merchandisers and production planners were not getting the information they needed fast enough on the movement of inventory so they could get just the right amount of merchandise to the marketplace while it was still in heavy demand, he explained.

A relatively low average unit price for its goods makes close control of Fritzi's costs essential. "However, we found that our data processing and clerical costs were rising disproportionately to sales," Jenkins said.

The firm began to send overflow keypunching to several different ootside shops, and its order processing was constantly behind schedule. The workload in accounts receivable and other areas of accounting reached "crisis proportions," he added.

Only Practical Solution

In mid-1976, management concluded the only practical solution was to install an in-house computer and an on-line, interactive system to handle order entry, invoicing, accounts receivable, material control, production planning and daily sales reporting.

"Our situation was so critical that we could not spare the time to develop a new system from the ground up," Jenkins said. So Fritzi began studying the handful of packaged systems available at that time.

Because Fritzi "liked the hardware from the three manufacturers," it considered Burroughs Corp., Hewlett-Packard Co. and IBM. "The HP package was from a service bureau we had very little respect for, the Burroughs program never developed [as promised] and IBM had a firm thing called Apparel Business System (ABS) that we zeroed in on," Jenkins said.

The ABS was installed in June 1977. After some fine-tuning to adapt the system to Fritzi's specific requirements, "we were in a position to actually begin booking orders the following month," Jenkins noted.

The ABS applications now run on an IBM 370/148 with 1M byte of main memory and three 3350 disk drives supplying 2.8G bytes of on-line storage. There are three 3420 tape drives and a 2501 card reader that "we never use," Jenkins said.

On-line, interactive computing is done using 63 Model 3270 CRT terminals located in the company's various operating departments. The network also includes four Model 3289 printers operating at 150 line/min and one 3203 at 1,200 line/min, serving the firm's three shipping lines and the accounts receivable/credit areas.

Fritzi of California is a beta test site for IBM's DOS/VSE operating system. Fritzi has been running it for the past eight months and found it to be "exceptionally good" and the compatibility of the entire system to be "fantastic," according to Jenkins.

Fritzi has a 4341 on order, which it hopes to acquire by next summer.

Order entry is a key application in the system. Incoming orders now go to five data entry operators who input the order data through CRTs. The computer automatically validates customer numbers, styles and color codes at the point of entry, alerting operators to any errors through messages on the terminal screen.

Operators must key in only minimal data, since other information such as account name, address and ship-to instructions are supplied automatically from the account master file. The computer automatically extends and totals the prices.

During the procedure, the computer runs a credit check on the accounts involved, using currently updated Dun & Bradstreet exception credit information stored on disk. "We now process up to 1,000 orders per day, more than twice the volume of orders we were handling with the keypunch operation," Jenkins noted.

In customer invoicing as well, the system has speeded the operation and generated significant savings. Since computer-generated invoices are automatically printed right at the shipping line, the invoices can be included in the cartons and shipped with the merchandise.

"That lets us save approximately $70,000 a year that otherwise we would have to spend on postage to mail the invoices separately," Jenkins noted.

Dramatic Benefit

One of the most dramatic benefits of the system is the improvement in the flow of market information to management, according to Jenkins. "Where in past operations major buy/no-buy and cut/no-cut decisions were based primarily on intuition, the on-line system now allows the use of important sales information in producing a wide range of sales analysis reports," he said.

The key management tool is a daily sales report that shows the total amount of sales booked and shipped that day and season-to-date for all lines, covering both the current and future style seasons.

"I would hate to think of the chaos we would be going through today without the planning ability the system gives us," Jenkins said. "For example, where four years ago we had only about 10 fabrics to deal with, we now have some 50 different fabrics in the line, and these change constantly to conform to all the different 'looks' that come and go in the junior sportswear field.

"The on-line system now gives our planners the ability to keep in tune with this very fickle market."

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Naval Center Credit Union Keeps Operations Afloat

Special to CW

NEW LONDON, Conn. — Employees at the Ft. Trumbull Credit Union (FTCU), located at the Naval Underwater Systems Center (Nusc) here, probably know very well what it means to get in over one's head.

That is why executives at the state-chartered institution recently scrapped their original mainframe and installed a Wang Laboratories, Inc. VS minicomputer that has been keeping the organization and its more than 2,600 members afloat ever since.

The credit union deals exclusively with the Navel center, catering to all personnel, pensioners, annuitants, their immediate families and all Nusc departments. Since the group is service-oriented, it must be able to react rapidly to the requests of the membership, whether it be in the form of financial questions or applications for loans, according to the credit union's manager, Dave Kenyon.

Conversion Under Way

When Kenyon joined FTCU in 1974, it was a completely manual organization with a staff of four full-time teller/bookkeepers, servicing 2,000 members. However, it was in the process of automating its operation.

"One of the underlying reasons I was hired at FTCU was that I wasn't opposed to working on the conversion of the present manual operation to a computerized system if the results of a system study already under way presented computerization as a solution," Kenyon observed.

Dave Kenyon (right), director of the Ft. Trumbull Credit Union, demonstrates the Wang Laboratories, Inc. VS minicomputer.

After checking with a number of other credit union offices and computer manufacturers, Kenyon and two colleagues — Ted Einstein, a former treasurer of the credit union, and Mark Becker, a computer systems analyst — decided on a Basic Four Corp. 400 BB-1 CPU. A similar system was working at a credit onion in Caladonia, Ont., Canada, and seemed to fit FTCU's special needs.

(Continued on Page 68)

MPU-Based Desktop System Performs WP, DP Functions

PROVO, Utah — Zeda Computers International has unveiled a self-contained microcomputer system that handles both data processing and word processing (WP) chores and has a potential disk storage capacity of 3.4M bytes.

Housed in a desktop cabinet, the Zeda 580 has a Z80A microprocessor and 65K bytes of dynamic random-access memory (RAM). The system supports two RS-232 serial ports, two parallel ports plus a parallel printer port, one hard disk port and a floppy disk drive connector capable of carrying two external floppy disk drives — either mini or 8-in., a spokesman stated.

The basic system has two standard double-density minifloppy disk drives that provide access to 400K bytes of on-line storage, a keyboard and CRT. In addition, the unit incorporates a direct memory access (DMA) controller that can be programmed to interconnect nearly all of the interfaces with the internal RAM, keyboard and CRT terminal.

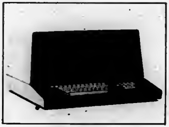
Programmable Keys

Twenty-four of the keyboard's keys are software-programmable for a total of 48 special functions utilized by the firm's word processing, inventory and accounting software, the spokesman added.

The 580's disk operating system is CP/M-compatible and can handle all interrupts, data transmissions, keyboard definitions, error detection and disk storage and retrieval functions.

Finally, the unit contains a real-time clock, audio beeper and parity-checking logic. It can be reprogrammed to facilitate foreign graphics or graphics video displays.

The Zeda 580 is priced at $6,837, which includes the operating system software and a choice of one application package, the spokesman said from 1662 W. 820 North, Provo, Utah 84601.



The Zeda 580 System

DG Controllers Get Tape System

SAN DIEGO — Innovative Data Technology, formerly Tandberg Data, Inc., has unveiled an IBM/Ansi-compatible .5-in. digital tape system fur Data General Corp. 4030 and 4196 magnetic tape controllers.

The Mudel MTS 1050-22 was designed to operate with DG's RTOS and RDOS operating systems through an adapter that plugs into the CPU chassis. The subsystem itself consists uf a tape transport and a formatter that provides dual-density, 9-track operation.

The tape system has both 800 and 1,600 bit/in. phase-encoded recording and playback capabilities.

The unit features a maximum I/O data transfer rate of 36K- and 72K byte/sec. Up tu eight tape transports can be daisy-chained to a single-MTS 1050-22 subsystem for disk backup or archival storage, a spokesman noted.

The subsystem is priced at $8,150, while the slave drives cost $5,450. Discounts are available with quantity purchases from Innovative Data Technology at 4060 Morena Blvd., San Diego, Calif. 92117.

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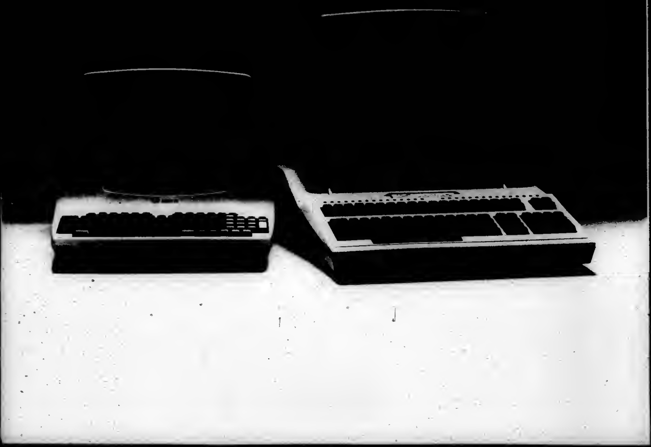

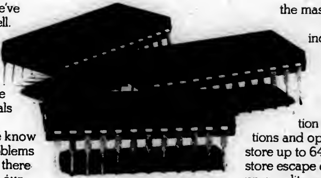

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And, if you run into problems, just call our special Applications Engineering Staff. They'll help you through any difficulties with reprogramming, interfacing, setting the terminal's personality, special applications, or understanding the features and functions.

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Desktop Turnkey Based on 8085

Micro Built for Small Businesses

VAN NUYS, Calif. — Ipex International, Inc. has introduced for the small business user a desktop microcomputer system that features a built-in dual floppy disk drive and up to 56K bytes of random-access memory (RAM).

The Ipex 8085 is based on Intel Corp.'s 8085 microprocessor, but is fully compatible with 8080-type software, according to its vendor. The system includes a CRT terminal and at least 600K bytes of on-line disk storage, which can be expanded to 1.2M bytes.

Users start up the system with a single keystroke. Following this, each location of the RAM is automatically tested and the installed memory size and operating system status are flashed on the CRT screen.

The turnkey package is supplied with disk-based Extended Basic software, a disk operating system and a utilities package including a 3K-byte programmable read-only memory-resident system monitor.

Other software supported on the 8085 includes CP/M, CBasic, Microsoft Basic, Fortran-80, a data base management package and a variety of commercially available applications programs a spokesman said.

The cost of the system, with software documentation and maintenance manuals, is $3,695. However, quantity discounts are available for OEMs and system houses, Ipex said from 16140 Valerio St., Van Nuys, Calif. 91406.

Ipex 8085

Disk System From Datrex Has 10M Bytes

PHOENIX — Datrex, Inc. has announced a cartridge disk system that provides 10M bytes of storage for Digital Equipment Corp. PDP-11 and LSI-11, Data General Corp. Nova or Interdata, Inc. computers.

The system includes the cartridge disk drive plus an embedded controller that is geared for the user's microcomputer or minicomputer system.

According to a Datrex spokesman, the storage capacity of the unit makes it possible to replace or add the equivalent of four DEC RK-11 drives, saving hardware space. The system is fully compatible with both the user's interface and software.

The disk drive package costs $3995 from Datrex at Suite 109, 3101 W. Thomas Road, Phoenix, Ariz. 85017.

System Based On Micronova

WOODLAND HILLS, Calif. — Targeted for the small business and office environments, Compal, Inc.'s Model 9000 computer system features a 16-bit processor and both hard and removable cartridge disk media.

Based on Data General Corp.'s Micronova 602, the Model 9000 has 64K bytes of random-access memory and a CRT terminal with a detached keyboard. Three terminals can be added to the system, a spokesman said.

The hardware includes a 10M-byte hard disk with a 5M-byte removable cartridge disk drive. An additional 12.5M bytes of storage can be added to the system to accommodate expansion.

The package also incorporates a high-speed matrix printer.

Software applications that can be run on the system cover order entry billing, inventory control, sales analysis and other typical business programs as well as a data base management system and a communications routine.

The Model 9000 sells for $19,995. Software packages between $1,500 and $2,500 are available as integrated products.

Compal is at 6300 Variel Ave., Woodland Hills, Calif. 91604.

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CLEARWATER, Fla. — Data recording products, forms, custom furniture and other minicomputer and office supplies are featured in a catalog by Executive Computer Supplies.

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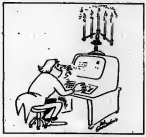

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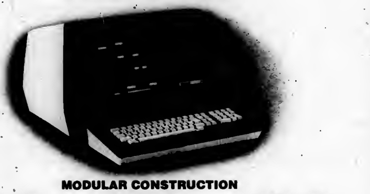

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SALEM, N.H. — Designed for remote unattended dual-track selection, MFE Corp.'s Ansi/Ecma-compatible digital cassette tape transport features a two-track read-after-write head so the operator does not have to flip the cassette at the recording midpoint, the vendor said.

The MFE 452B, after conventionally writing to Track 1, rewinds the cassette and electronically switches tracks. Either track can be accessed at will; it takes about 150 msec to switch tracks, a spokesman claimed.

The device has a data transfer rate of 32K bit/sec. It can store up to 720K formatted characters.

Long-term transport speed accuracy is provided by a built-in Tachlok speed control, according to MFE. The unit has a 15,000-hour mean-time-between-failure rate.

Priced at $750, the 452B can be ordered from MFE's Digital Products Group, Keewaydin Drive, Salem, N.H. 03079.

Boards Allow Decsystem-2020 To Store More Than 2M Bytes

CRANBURY, N.J. — Incorporating 16K dynamic random-access memory chips, Dataram Corp.'s single-board semiconductor add-on memory provides an additional 256K bytes of storage for Digital Equipment Corp. Decsystem-2020 minicomputers.

The DR-120S board is internally structured as 64K-byte by 32-bit words, consisting of 36 data and seven error-correcting bits.

The memory units can be operated in conjunction with or in place of DEC's Model M8629 semiconductor array Dataram said. They interface to the 2020's resident timing and control board.

The cycle and access times of the add-on boards are 1,050 nsec and 600 nsec, respectively. The DEC machine can accommodate up to eight boards; expanding the minicomputer's memory to more than 2M bytes, a spokesman stated.

The 256K-byte boards are priced at $5,600 each from Dataram at Princeton-Hightstown Road, Cranbury, N.J. 08512.

Apple Users Gain Remote Regulator Of Electric Units

SANTA CRUZ, Calif. — Mountain Hardware, Inc. has introduced a plug-in control system for Apple Computer, Inc. microcomputers that is said to allow users to regulate electrical devices by commands sent over 110 Vac wires.

The control system consists of the Introl/X-10 controller card, which plugs into the Apple's peripheral slot, a BSR/X-10 command console that plugs into an ac outlet and three remote modules.

The system comes with software, incorporated on the controller card, that allows the user to affect electrical devices on predetermined schedules, such as a particular day of the week or an exact date for a particular event, a spokesman noted.

The system costs $279, but the controller card can be purchased separately for $189. Additional remote modules are also available for $15 from Mountain Hardware at 300 Harvey West Blvd., Santa Cruz, Calif. 95060.

Time Controls TRS-80, Printer

HOLLYWOOD, Calif. — National Software Marketing, Inc. has taken the plunge into the hardware pool by announcing a printer timer geared for Radio Shack TRS-80 microcomputers and Centronics Data Computer Corp. Model 779 printers.

The timer can turn the printer on and off automatically using signals sent over the printer cable.

It requires no software or hardware modification other than soldering three wires to the printer and mounting the unit to the inside of the printer cabinet, a spokesman stated.

The timer costs $95 from National Software Marketing at 4701 McKinley St., Hollywood, Fla. 33021.

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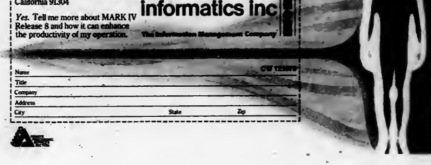

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Mini Keeps Naval Center Credit Union Afloat

(Continued from Page 63)

Unfortunately, after FTCU acquired the hardware/software package, Kenyon discovered that the software, which was written by a Canadian firm, required a great deal of rewriting in order for it to process the credit union's accounts.

Not only were the software's disk utilization routines unusable, but the programs could not even correctly calculate simple loan interest rates, Kenyon recalled.

However, after all of these major bugs were chased out, the system began to turn things around in the financially growing office.

Operations that were once very time-consuming took less time, passbooks were eliminated and statements were generated for the then 2,500 members in about 16 hours.

Up to the beginning of 1978, the response FTCU received from its members was very enthusiastic. It then began to explore new areas of service.

"For the past four years, the system has done what we expected of it and offered us the opportunity to start thinking about new, multifaceted offerings of services to our members," Kenyon commented.

"But at the same time, we could also see some grave growth limitations of the system that would hamper our ability to add some future services.

"We could handle all the members' requests — we could easily handle 175-200 transactions, consisting of deposits and withdrawals, each day, and this with no increase in our staff," Kenyon continued.

"But the real challenge was ahead of us — automatic account transfer, term certificates, car loans, management reports."

The credit union formed a committee, headed by Kenyon, to investigate the Basic Four machines and other computer systems to see if they could meet FTCU's down-the-road needs.

In their search, there were three major considerations: price, the system's ability to handle a large tape drive and the manufacturer's ability to supply an extensive security system to protect the members' data.

The group decided on Wang's VS minicomputer, which not only offered a well-integrated security system and the facilities to accommodate industry-standard tape drives, but also had telecommunications capabilities, Kenyon said.

In addition, the system could be expanded by 32 terminals, up to 512K bytes of memory and up to 2.3G bytes of disk storage.

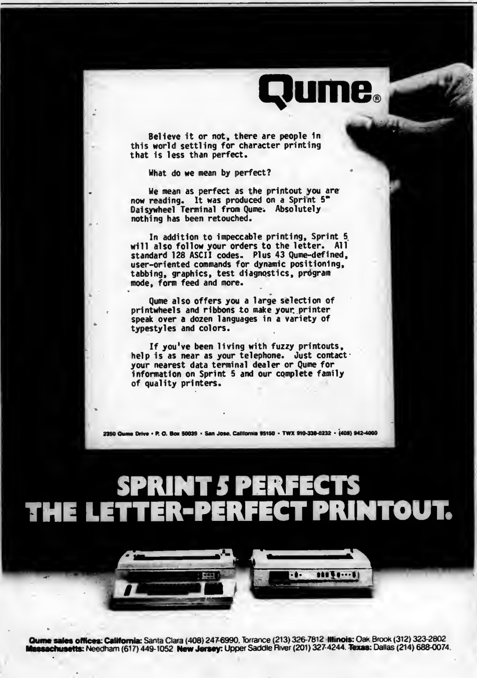
Software Considerations

Software was another important reason for selecting the Wang machine. Writing in code in Basic on the Basic/Four system was extremely difficult and cumbersome, Kenyon observed.

However, with Wang's Editor and Ezcobol, FTCU was able to design and code the new system in two months, resulting in substantial savings in personnel costs and time, Kenyon said.

Right now, Kenyon is trying to get off the ground the idea of a "regional processing center," which would allow a number of smaller credit unions who cannot afford a system, or are presently too small for one, to tie into a centrally located site.

This arrangement would save the smaller credit unions money and time, plus offer them growth in service. At the same time it would allow them to retain their anonymity, since the files for each credit union would be secure and separate from the files of any other users on the system, Kenyon remarked.



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Aussie Roots DP Mission in U.S. Soil

By Tim Scannell
CW Staff

SAN JOSE, Calif. — Australian Michael Roberts decided 10 years ago to focus his attention on bringing together companies "down under" by spreading the word on microcomputers and data communications. He recently expanded his mission by more than 6,000 miles, rooting his goals in U.S. soil.

Far from being a modern-day corporate evangelist, Roberts is president and chief executive officer of ECS Microsystems, Australia's leading communications systems builder and a serious contender in the European DP market. In October, the firm plunged into the U.S. arena by establishing its international manufacturing and marketing headquarters here, right in the heart of Silicon Valley.

ECS deals in microcomputer-based, integrated hardware/software packages that plug into and emulate large mainframes such as IBM, Honeywell, Inc. and Burroughs Corp. machines, Roberts said. So far, the firm has sold about 3,500 systems throughout Australia and Europe, including some to a number of government agencies and to such communications giants as Telecom — the Australian equivalent of Ma Bell.

In fact, one of the company's first jobs was to put more than 300 Aussie stock brokers on-line with the Melbourne Stock Exchange, a feat accomplished by harmonizing the activities of several Digital Equipment Corp. PDP-10s and PDP-8s.

New Challenges

But things have become "too easy" in Australia, Roberts joked, and the shift to the U.S. offers new challenges and goals.

In Australia, the DP market is fragmented and "we have to go all the way from word processing applications, to newspaper publishing, to on-line terminal systems, to stand-along systems," ECS' president explained. But in the U.S., "I think we've got the luxury of saying

(Continued on Page 76)

Financing for the 1980s: Two Views

• *Unstable Decade Ahead*

NEWTON, Mass. — A prime rate in excess of 15% may not seem so high when compared to a 13% annual inflation rate or when it permits a company to survive, Peter H. McCormick, president of the New England Merchants National Bank, suggested here recently.

Along with high interest rates, McCormick predicted the 1980s would be an unstable and uncertain decade and told financial managers attending a recent American Electronics Association meeting here that planning is the best weapon for combatting uncertainty.

However, aside from the best-planned belt-tightening maneuvers — such as discontinuing unprofitable product lines, using retained earnings for financing, tightening inventory control and collecting receivables more efficiently — McCormick sees commercial lenders as inevitable and primary sources of long- and short-term capital for most companies.

The key to borrowing is "how much risk a company is willing to accept," McCormick stressed. A company cannot plan unless it adopts a "viewpoint on the fu-

(Continued on Page 70)

• *Venture Investment Up*

By Marcia Blumenthal
CW Staff

NEWTON, Mass. — Despite on-going predictions of a recession, investors have committed $1 billion in new venture capital during the last 18 months, and today there are 30% more venture investment firms operating than during the 1973-1975 recessionary period, venture capitalist William H. Congleton noted here recently.

"Today $4 billion is al work in the venture capital industry," according to Congleton, cofounder and general partner of the Palmer Organization, a private venture firm.

The number of competent people seeking venture capital has increased significantly, Congleton said during a joint meeting of the American Electronics Association (AEA) and the New England Venture Capital Association.

Contributing to the healthy outlook for the venture capital investment market is the U.S. government's recognition that business — in particular, smaller innovative firms — must be stimulated to ensure growth in the stagnating economy.

The passage of the Steiger-Hansen Act last year, which reduced the maximum capital gains tax rate from 48% to 25%, is evidence of the government's recognition of the need for business stimulation and has prompted investors to commit funds for venture capital, Congleton maintained.

Right now a bill is under discussion in Congress that would defer the payments on capital gains earned from investments in smaller companies.

Encouraging Signs

In addition, Congleton pointed to other encouraging signs for the venture market. One of these is the increased funneling of funds into venture firms not only by traditional investors, but also

(Continued on Page 70)

Itel Transfers Lease Underwriting

SAN FRANCISCO — As part of its financial solvency program, which involves paring down business to bare-bones capital equipment leasing, Itel Corp. has signed an agreement transferring its capital equipment lease underwriting business to several of its employees.

These employees are forming TXL Corp., which will begin operations on Jan. 1. The terms of the transaction were not disclosed.

Robert Bishop and Mike Buchanan are the principles in the few firm.

The lease underwriting portion of Itel's business is relatively small, accounting for only 4.5% of the firm's total revenues in the first three quarters of 1979, a spokeswoman said.

Lease underwriting involves putting together all the parts of a tax leverage leasing program. In many cases, the lease underwriter takes an order position for the equipment, but does not ultimately hold an equity position in the equipment once it is placed.

However, Itel will continue its operating lease program, now concentrated in capital equipment for the transportation industry.

Although out of the plug-compatible computer business since transferring that activity to National Semiconductor Corp. on Oct. 1, Itel will continue to remarket IBM systems now coming off leases. Prior to starting its IBM-compatible Advanced Systems line in 1976, Itel marketed IBM equipment.

In addition, Itel is still in the process of divesting its four or five remaining computer service enterprises.

Substantial Loss

As expected, Itel reported a substantial loss for its third quarter. That loss totaled $176.1 million, bringing the nine-month loss to $226.2 million.

Revenue for the third quarter totaled $136.2 million, with nine month revenues reaching $460.5 million.

In commenting on the company's performance, Thomas S. Tan, Itel president and chief operating officer, said the losses were impacted by "writing down computer-related assets to their anticipated liquidation value" and the creation of a reserve for other parts of the business the firm intends to discontinue.

The firm will file claims of about $200 million with Lloyd's of London in connection with its computer leases. To date, the firm said, it has filed $8 million worth of claims.

Magnuson Launches Expansion

SANTA CLARA, Calif. — Magnuson Systems Corp. has started an expansion program that will result in the doubling of its manufacturing space this month.

In addition, the firm has ended its six-month search for a marketing chief with the hiring of Jerry Burke.

Magnusor, has leased a new 75,000 sq-ft manufacturing facility in North San Jose. The firm, with about 60 manufacturing employees, is operating at full capacity at its current headquarters, President Joseph L. Hitt said.

Next summer, Magnuson's administrative and engineering staffs will move to a 50,000 sq-ft area in the same complex.

The expansion is a direct response to the increasing demand for the company's M80 IBM-compatible processors, Hitt said. To date, the firm has installed 50 systems and is shipping 10 units per month.

Although sales are not as high as the company would like, Hitt said the expanded manufacturing capacity is necessary at this time.

In announcing the appointment of Burke as vice-president marketing, Hitt said he had been looking for someone "who'd been in the trenches selling against IBM." Hitt was committed to taking as long as necessary to find the right person, he added.

For the past six-and-one-half yats, Burke was vice-president of western operations for Univac.

In another move, Hitt appointed Peter W. Cassady vice-president of Magnuson's western operations. Cassady was previously the Western sales manager for Control Data Corp.

Office Micrographics to Grow

WALTHAM, Mass. – Micrographics will account for an increasing share of the automated office market, a study by International Data Corp. (IDC) has predicted.

Computer-assisted micrographic retrieval will increase 87%, word processors outputting to computer output microfilm (COM) will grow 85%, the merging of text and graphics on micrographics will grow a reported 74% and electronic mail outputting to COM will expand by 94% over the next two years, according to the report.

The growth can be attributed to the increasing sophistication of the current user of information-handling equipment. That user is beginning to demand the ability to interface micrographics with other office equipment, according to IDC, which estimated that the automated office market will be worth $16 billion by 1985.

IDC also forecast that micrographics will account for a significant portion of the dollars spent on hardware, software and related media.

Entitled "Micrographics in the Office: A Market Study," the report also includes several case studies that detail how some organizations have automated their offices and interfaced various information handling technologies.

The 80-page market survey costs $400 from IDC at 214 Third Ave., Waltham, Mass. 02254.

Decade of Uncertainty Ahead for Financiers

(Continued from Page 69)

ture." Most financial managers are "posturing" their companies to operate in an unstable environment during the 1980s.

While borrowing may be inevitable, McCormick jocularly suggested that the banking industry has become so competitive that "the chance of finding a stupider bank down the street or one that will haggle with you is pretty good."

Despite the inevitability of bank borrowing, some government programs are boons to small or medium-size businesses, Peter Maher, senior vice-president of the State Street Bank, contended.

Industrial Revenue Bonds under the Internal Revenue Service allow a company to issue tax-exempt bonds as long as the funds derived from the sale of these bonds are used for capital expansion, which in turn creates jobs.

The cost of borrowing for a company issuing these bonds figures out to about 9% to 10% annually, Maher said. Interestingly, in the past 12 months, 160 preliminary certifications valued at $350 million have been made for this class of bonds.

Relatively few hitches accompany these bonds, but because of the mechanics involved, Maher urged electronics executives to "have the best armed counsel you can – and corporate lawyers are not necessarily the best [for this transaction]."

The ceiling on these bonds is $10 million, and they must be certified by a government municipality.

In addition to Industrial Revenue Bonds, the government operates several loan guarantee programs.

One of these is the Economic Development Administration loan guarantees for companies in high unemployment areas. Ninety percent of Massachusetts, one of the country's high technology capitals, qualifies, Maher said.

Investment Up In New Ventures

(Continued from Page 69)

by newer entrants such as pension funds and educational institutions. Another bright sign in the renewed interest in growth companies by investment analysts.

Most newcomers seeking venture capital are veterans of larger firms, where they have had excellent training and are therefore apt to be looked upon favorably by venture capitalists.

On the Upswing

The majority of the capital committed by venture capital firms is for expansions, but company start-ups and early phase financing are on the upswing, Congleton said.

When questioned by AEA members on whether venture firms are increasingly committing funds as medium-term loans as opposed to equity financing, Congleton noted that most financing still tends to be in the form of equity.

Check the charts. WANG beats IBM.

IBM recently announced two new computer systems the IBM 4331 and 4341

We suggest you take a careful look at both of them

Because that way you'll appreciate Wang's remarkable VS computer family and the new VS 100 processors that much more

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Major industry analysts consider Wang's VS systems more advanced than IBM's 4331 and 4341*

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The VS has a high degree of compatibility with IBM 370 application software – even higher than IBM products like the System 38 and 8100

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Price	$37,000 (512K CPU)	$65,000 (512K CPU)	$245,000 (2 MEG CPU)	$93,000 (1 MEG CPU)
Performance Index	1.0	1.1	3.7	5.0
Comparable IBM System	138	138	148	158
Operating System	Multi-User Interactive	BATCH	BATCH	Multi-User Interactive
System Expandability	DP WP TP	DP TP	DP TP	DP WP TP
Cache Memory	N/A	8K Bytes	8K Bytes	32K Bytes
Memory Range	128K – 512K	512K – 1 MEG	2 MEG – 4 MEG	256K – 2 MEG
On-Line Disk Storage	2.3 Billion Bytes	9 Billion Bytes	18 Billion Bytes	4.6 Billion Bytes
Delivery Date	10 Weeks	1-2 Years	1-2 Years	12 Months

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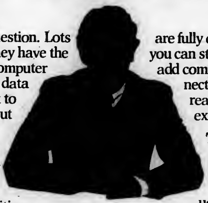

Russell Planitzer, Vice President, Marketing Development, Prime Computer

“That’s a tough question. Lots of companies claim they have the technology to move computer power away from the data processing center, out to where the action is. But technology isn’t the whole answer: when you start building a new computer network, you don’t want to destroy the capabilities you already have. And you don’t want to limit future growth.

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“Better technology cuts risk too. We offer the most advanced networking products available, like our industry-standard X.25 software package that lets you plug into packet-switching networks worldwide. And PRIMENET,™ our remarkably flexible networking software ‘umbrella.’

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Insac Restructuring

LONDON — Because of a growing interest in Viewdata-related products, the National Enterprise Board (NEB) here will restructure its wholly owned subsidiary, Insac.

Insac was orginally formed by the NEB in 1977 to invest in software products developed by selected British software firms and to assist these firms in exporting their products. However, over the past two years Insac has identified significant opportunities in Viewdata products and has been building up a successful business in this market, the NEB said.

Viewdata is one of the generic terms for an interactive data base retrieval system that displays a wide variety of information — stored in a computerized central data base — on a TV screen located in the user's home or place of business.

Both the still-to-be-named Viewdata company and the software company will remain 100% owned by the NEB and will be funded from the $43.2 million allocated by the NEB for investment in software activities.

John Pearce, managing director of Insac, will head up the Viewdata company. Neil Pearce, director of Insac operations, will become managing director of Insac.

Mini Users Seen Budgeting $69,000 for '80 Software

WALTHAM, Mass. — Average software budgets at minicomputer sites will increase to $69,000 by 1980, up from $48,000 last year, according to statistics gathered by International Data Corp. (IDC) here.

Large amounts of money — as much as $310,000 — are spent by strictly minicomputer installations. Although nearly 80% is currently spent in-house, most users would like to spend more with outside sources, IDC learned.

Development and maintenance of applications software make up the bulk of the internal expenditures. A greater percentage of the external money is spent with custom consultants than with hardware vendors or with independent vendors of packaged software.

This trend, according to IDC, will continue through 1980. The research firm predicted that more dollars will be spent with both custom consultants and hardware vendors than with packaged software vendors.

IDC research also found a degree of correlation between software spending and the number and size of the CPUs at any given site. Software spending appears to increase dramatically when measured by single vs. multiple CPUs, but does not increase proportionately with the addition of each CPU, according to IDC.

IDC's survey included 91 users whose software budgets ranged from less than $20,000 to more than $75,000.

The research results can be obtained for $395 from IDC in its research brief entitled "Software Spending Patterns of Minicomputer Users." IDC is at 214 Third Ave., Waltham, Mass. 02254.

Supershorts

GRI Computer Corp. is offering distributorships for its Grip systems, which are targeted for first-time users in the specialty manufacturing market.

The GRI agreement features discounts up to 40% on systems that sell in the $16,000 to $24,000 range; 70% of maintenance fees; buy-out provisions; packaged training; and built-in promotion programs at no charge. Deliveries are currently scheduled at 60 days, the firm said from 320 Needham St., Newton, Mass. 02164.

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HORIZONTAL SPACING	10 or 16.5 CPI	10 CPI
PAPER LOADING	Bottom and Rear	Rear only
CABLE-THROUGH	Standard	Optional extra
UNDERLINE	No run-in with character descenders	Interference with descenders
MOUNTING	Pedestal and Paper Basket (standard)	Pedestal not available Paper Basket optional

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National will continue all previous Itel service and support functions for the Advanced Systems and peripheral products. This commitment exists not only for the sale of new equipment, but also for on-going maintenance, spares, and engineering changes.

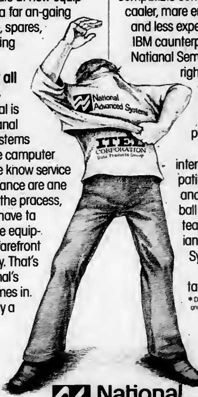
We're going all the way.

Our goal is to build National Advanced Systems into a full-line computer company. We know service and maintenance are one giant step in the process, but we also have to deliver reliable equipment at the forefront of technology. That's where National's expertise comes in. We're not only a leader in semiconductors, we've used that expertise to build more compatible mainframes than any other independent manufacturer.

We know how to build compatible computers smaller, cooler, more energy-efficient and less expensive than their IBM counterparts. And National Semiconductor is right there with the committed backing to make all our plans come true.

So if you're interested in compatible systems and want to play ball with a great team, contact National Advanced Systems.

We're out to win.



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* Datapro Research Corporation's annual survey 1979

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Acquisitions, Mergers in Services Completed

In keeping with a growing trend in the services industry, three firms recently completed mergers or acquisitions.

Comshare, Inc. will acquire all the common stock of Computer Research Co. (CRC) effective Jan. 1, 1980. Comshare paid a $3.75 million down payment for CRC and will make additional payments during the next two years amounting to no more than $1.25 million.

In commenting on the purchase, Richard P. Eidswick, Comshare senior vice-president, said the acquisition of CRC will "strengthen Comshare's staff, equipment and software expertise in large-scale IBM computers."

In addition, the move will bring Comshare a client base enabling it to profitably expand into new product areas based on IBM technology, he said.

Prior to the acquisitions, 21% of Comshare's U.S. revenues was derived from processing services performed on IBM systems. CRC, with current revenues of $7 million annually, operates remote computing services using IBM 370/168 and 3033 processors.

On the West Coast, Hale Brothers Associates, Inc. of San Francisco has acquired Remote Computing Corp. of Palo Alto, Calif. The move is part of Hale Brothers corporate expansion program that began three years ago to build a company in the computer services and communications field, Richard Pershing, the firm's president, said. Prior to this effort, Hale Brothers was a venture capital firm specializing in high technology companies.

Remote, with annual revenues of more than $12 million, offers a range of services to the thrift, mortgage and investment industries nationally and operates two Burroughs computer centers: one in New York and one in Palo Alto.

Hale Brothers has four other subsidiaries: Computer Election Systems, Datron, Lightweight Processing Co. and Prospect Properties, offering services to government agencies and to the construction and real estate markets.

Terms of the transaction were not disclosed.

In another move, KRS Systems Corp. of Westport, Conn., and TSA Software, Inc. of Monroe, Conn., have merged, forming a new company, Infosoft Systems, Inc.

KRS Systems, a Data General Corp. OEM, developed a major portion of the nationwide reservation systems used by the Sheraton hotel chain, in addition to creating custom software for on-line applications for DG minis, according to Kenneth R. Short, president of the newly merged firm.

TSA, a year-old firm, specializes in consulting services and the development of microcomputer software.

Aussie Roots DP Mission in U.S.

(Continued from Page 69)

'let's just start by doing one particular thing . . . and do it really well.' "

According to Roberts, that "thing" is data communications — linking businesses and businesspeople with networks of microcomputer systems.

"The idea is to access the great amounts of data that big name firms have been accumulating all these years and to get it out into small machines on an executive's desk," he explained. That way, they "can access it, quickly process it and quickly get their reports out."

To kick off its American venture, ECS opened a $3.5 million, 48,000 sq-ft facility in San Jose and hopes to have it fully operational and staffed with about 200 people by the beginning of next year.

In addition, by the fall of 1980, Roberts plans to have at least six sales and service offices scattered throughout California and will boost his initial work force by another 50 employees.

Presently, by comparison, the firm's Australian operations has about 150 workers.

Not one to shirk an executive challenge, ECS' determined president will head the U.S. plant himself — aided, at first, by a few of his Australian colleagues. Eventually, however, the facility will be totally staffed by U.S. employees.

While Roberts isn't turning his back on his Australian parent operations — ECS is opening a second plant this July in Sidney — he has made San Jose his headquarters rather than just a subsidiary or corporate arm. Part of the reason for this move is the general availability of computer parts in the U.S. compared with supplies down under, he pointed out.

Working from Australia, ECS workers have to schedule deliveries a year in advance, engage in extremely careful inventory management and sometimes wait months for needed parts because of the shipping distances. In addition, parts are a bit more expensive with all of the added freight charges, import taxes and distributor fees, Roberts said.

"It sounds like a small thing, but when you put all of those factors together over something like 300 components, it becomes a continuous aggravation that we just don't need," he commented.

On the other hand, if ECS' American plant happens to run short of a specific part, "all we have to do is get in a van, run up to the local supplier and get some," Roberts added, describing the Silicon Valley area as an "electronics mecca." Being closer will make "us much quicker on our feet."

Roberts noted that other locations, such as Shannon, Ireland and Singapore, were seriously considered as potential homes for the new headquarters.

Marketing Formula

Besides building and peddling end-user and OEM systems — which are not only functional but have also won a number of design awards and certificates of merit in Australia and Europe — ECS will also transplant what it thinks is a sure-fire formula for marketing success.

Technically, the Australians are on a par with the rest of the world, but they tend to have a more intuitive and generalized approach to marketing than their contemporaries in the U.S., Roberts stated.

The Americans have an almost scientific approach to selling, he added. However, by mixing the Aussie's intuition with the American's marketing science, ECS hopes to take the communications systems market by storm.

The formula seems to work. ECS sold 10 of its systems to a major U.S. customer within the first few weeks of business, and the company plans a number of product introductions in the near future.

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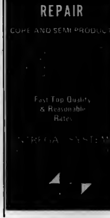
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Software AG Names Three

RESTON, Va. — In response to an annual growth rate of 70% during the past two years, Software AG of North America, Inc. has formed a Consulting Division and made several executive appointments.

Kenneth D. Rardin has been promoted to executive vice-president. Prior to this he served as senior vice-president in charge of technical operations and marketing support. He was responsible for the development of Software AG's Com-Plete teleprocessing system.

In addition to Rardin, Edward J. Forman was named vice-president of technical operations and Steve Greaves has been promoted to vice-president of development.

Colin Moore is the head of the new Consulting Division.

Executive Corner

Other Moves

- Robert T. Wall has been appointed vice-president of finance and administration and chief financial officer at Cipher Data Products, Inc.
- Art Withop has been named director of engineering for Magnex Corp., Inc.
- Max P. Beere has joined Imperial Computer Services, Inc. as vice-president of the Consulting Group.
- Ray H. Fentriss has been appointed vice-president of marketing for Satellite Business Systems.
- Kenneth W. Simonds has been named senior vice-president of U.S. field operations for Amdahl Corp.
- Stanley Jones has been elected vice-president of employee and industrial relations at Burroughs Corp.
- J. Ben Ryan has joined American Satellite Corp. as assistant vice-president for general services marketing.
- Carl H. Carlson has been named vice-president of operations at Apple Computer, Inc.
- Dr. Arthur J. Schneider has been named staff vice-president of the Sperry Research Center.
- Ralph W. Lowry has been appointed vice-president of product marketing and international marketing at Intertel.
- Walter R. Jonsson has been appointed assistant vice-president of international sales for T-Bar, Inc.
- Herbert F. Morrow has been promoted from sales manager to vice-president of sales at Yourdon, Inc.
- Alan R. Risley has been appointed an international regional manager for Datel-Intersil.

Bradford to Develop Trust System

NEW YORK — Bradford Services, Inc. has signed a long-term agreement to provide Canada's National trust Co., Ltd. with a computerized trust information system.

"When the network is fully operational, cost savings are conservatively estimated at $2.8 million annually. The development expense will be fully recaptured before the total system is on-line," Robert D. Dexter, assistant comptroller of National Trust, said.

Designed by National Trust, the system will be programmed, documented and tested by Bradford in three phases. It will involve more than 80,000 trust accounts and enable National Trust to deliver fully integrated trust accounting, asset management and cash control services to clients.

Although no monetary value was put on the contract, the agreement could extend up to six years, a spokesman said.

Spanning four time zones, the trans-Canadian computer system will compensate for differences in language, tax structures, monetary values and securities pricing in Canadian and U.S. securities markets.

Contracts

Other Awards

General Electric Co. and Memorex Corp. have entered into a four-year contract under which Memorex will purchase Terminet 200 matrix line printers from GE's Data Communication Products Department.

Sweda International has received a contract for 50 Model L-45 electronic cash registers from Playboy Clubs International of Chicago.

6
Major
Topics
12
Industry
Experts
20
Years
of
Data
Processing

As Computerworld looks back at the 70's and ahead to the 80's in our Year End Wrap-Up Issue.

According to E. Drake Lundell, Jr., editor of **Computerworld**, this special decade-ending Wrap-Up Issue is "designed to be read thoroughly, not just glossed over and shelved." We'll do this by focusing on six major topics of current high interest to users, with selected industry experts covering each topic. One expert will look back a decade, and another will write on the future. Here are the details.

Technology — As the (by now) well known saying goes, "If the auto industry had done what the computer industry has done in the last 30 years, a Rolls-Royce would cost $2.50 and get 2,000,000 miles per gallon." We won't go back 30 years, but one of our experts will look back at the 70's, while another will look ahead to the 80's and what we can expect in the way of technological changes and their impact on data processing.

Minicomputers — Did you know that Computer Control Corporation was the world's leading minicomputer company back in 1970? Do you know what happened to them? The minicomputer has come a long way in the last ten years. One of our industry experts will look at how far it has come, while another will examine its future

Medium to Large Systems — We've gone from tubes to transistors to large scale integration to very large scale integration. And the changes have been dramatic. Our experts will look at both the past decade and the coming decade to show you just how dramatic those changes have been.

Software — Nothing in the computer industry has been the butt of more jokes than "software" and all the images that word conjures up. But as we've all come to know, "software makes hardware happen" — and it will be increasingly important in the next decade . . . We'll also look at its development through the past ten years.

DP Operations — In 1970, "distributed data processing" was unheard of. Large central systems were the order of the day. We still have large centers of course, but we have a lot of other things as well. As DP has become a more integral part of the organizations it serves, DP Operations have become much more complex. Experts will look at both the past and the future.

Communications — It wasn't very long ago that the key to computer communications was the person who carried the punch cards from one office to another. So there's a lot of change to review — and a lot more to come in the 80's. Two experts will look at this aspect of data processing.

PLUS . . . We'll have short articles from industry leaders, both old-timers and young up-and-comers . . . and we'll take a humorous look at some of the predictions the experts were making back in the 70's and how they came out. (We'll also look at some predictions that were missed, like the microcomputer explosion.)

This could be the most important issue of **Computerworld** this year. If you want to find out what has been so you can better guess what will be; don't miss our December 31st issue. And if you market products or services in the computer field, you'll want your ad there. Closing date is December 14th. Your **Computerworld** representative can give you complete assistance in ad planning. Or, to reserve space for your ad, call Frank Collins at (617) 965-5800.

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HP Revenues Up 36%

PALO ALTO, Calif. — Hewlett-Packard Co. reported a 36% increase in revenues, and a 33% increase in net earnings for fiscal 1979.

For the year, HP's revenues totaled $2.35 billion compared with $1.73 billion in 1978. Sales of data processing products totaled just over $1 billion for the year, 42% more than last year, HP President and Chief Executive Officer John A. Young noted.

Earnings for the year were $203 million or $3.43 per share, up from $153 million or $2.63 per share a year ago. All earnings have been restated to reflect a two-for-one stock split on June 27.

Despite record earnings, net income as a percentage of sales dropped from 8.9% in 1978 to 8.6% this year. Young explained that earnings, particularly those in the fourth quarter, were "impaired by greater-than-expected increases in material costs, including premium prices paid for components which are in short supply and for a higher than normal volume of subcontracting for fabricated parts."

Fourth-quarter earnings were up 8%, rising to $56 million or 93 cents per share from $52 million or 87 cents per share in the comparable period a year ago.

Revenues for the final quarter reached $679 million, a 31% increase from revenues of $517 million in the fourth quarter of 1978.

MAI Reports 33% Increase In Fiscal 1979 Revenues

NEW YORK — Management Assistance, Inc. (MAI) has reported year revenues of $271.9 million, a 33% increase from the $205.1 million reported in 1978.

Earnings for the year before extraordinary items totaled $18.9 million or $2.36 per share compared with earnings of $16.2 million or $2.06 per share in 1978. However, final 1979 earnings of $29.2 million or $3.66 per share reflect an extraordinary credit of $10.4 million or $1.30 per share.

MAI operates three subsidiaries: Basic/Four Corp., Sorbus, Inc. and Wordstream Corp.

The company's Basic/Four computer systems and maintenance product lines were responsible for earnings increases both for the fourth quarter and for the year, MAI Chairman and President Raymond P. Kurshan said.

"The progress of our word processing program, however, continued to be slower than planned during the fourth quarter and had a negative impact on operating results throughout the year," he explained.

Revenues from Basic/Four represented 63% of MAI's total revenue, a 44% increase from 1978 levels. At fiscal year end, Basic/Four's order backlog was 5% above last year's. Moreover, revenues from the Sorbus subsidiary increased 29%, accounting for 26% of MAI's total revenues.

However, revenue from Wordstream word processing systems decreased 5%.

For its final quarter, MAI's revenues totaled $80.3 million, up from $58.2 million a year ago. Earnings before extraordinary items was $5.3 million or 66 cents per share compared with $4.6 million or 58 cents per share in the year-ago quarter.

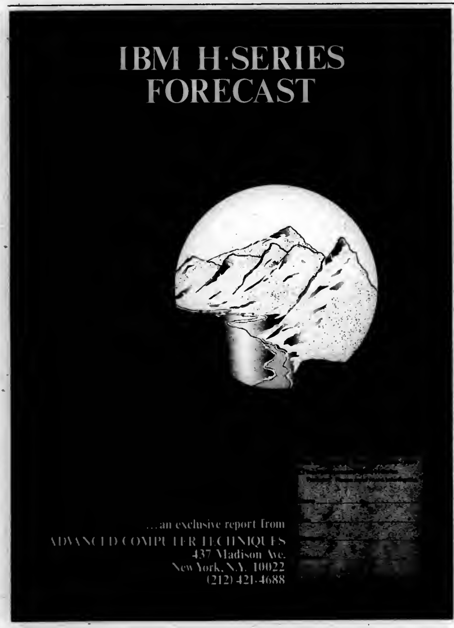
For the quarter MAI recorded a tax-loss carryforward of $1 million, which hiked total fourth-quarter earnings to $6.4 million or 79 cents per share.

Xerox Permitted To Acquire WUI

WASHINGTON, D.C. — Xerox Corp. was granted permission by the Federal Communications Commission (FCC) Nov. 20 to acquire WUI, Inc., the holding company that owns Western Union International, Inc. (WUI), a major U.S. international record carrier (IRC). Under an agreement reached earlier, WUI stockholders will trade their stock for Xerox common shares worth approximately $205 million.

The acquisition includes three other subsidiaries besides Western Union International. Cable & Wireless/-Western Union International, Inc. provides international Telex, leased point-to-point, voice and TV services to Puerto Rico and the U.S. Virgin Islands. WUI-TAS, Inc. provides telephone answering and alarm monitoring services. Airsignal Internationl, Inc. provides two-way mobile radio, paging, air-to-ground and rural radio services in 30 U.S. cities.

The commission approved the merger subject to five conditions.



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VLSI Circuit Design . . . Design of high performance state-of-the-art microcomputers, advanced integrated processor memory management chips and other exploratory devices to implement a line of fault-tolerant processors for use in communications. Involves use of advanced simulation techniques. (Holmdel)

Computer System Design . . . Design and evaluation of a family of fault-tolerant processors ranging from low-end microprocessor/microcomputer based processors to advanced high performance microprogrammed machines providing full emulation capabilities. Processors as components of distributed systems are of special interest. Embraces conception through pilot model. (Naperville/Holmdel)

Digital Circuit Design . . . Design of processor boards and processor sub-systems for VLSI implementation. Familiarity with processor concepts such as memory management, data cache, pipelining, system bus, bus arbitration and CPU characteristics and operations. (Naperville/Holmdel)

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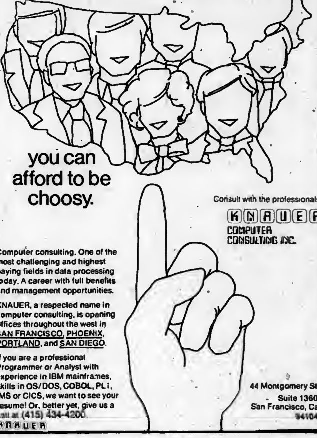

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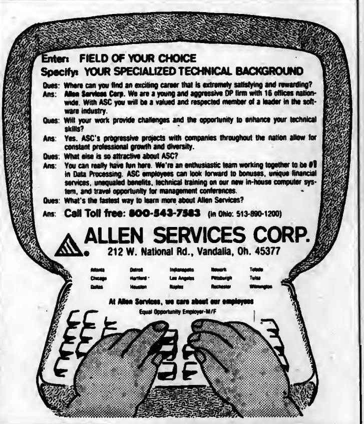

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Meil to: BSO/Automation Technology b.v.
P.O. Box 3059,
3502 GB Utrecht
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BSO/Automation Technology bv

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- Small IBM system experience in RPG, S-3, S-32, S-34, SERIES-1. Interasted candidates should submit their resume and salary history to Herb Menard, Manager Application Planning and Developmant.

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If you are interested and qualified, please forward your resume to: Richard Kisiel, Digital Equipment Corp., MO/P53, 274 Cedar Hill Road, Marlboro, MA 01752, or call COLLECT (617) 481-9511, ext. 6400. We are an equal opportunity employer m/f.

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Academy of Natural Sciences
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19th and the Parkway,
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Attn: Charles McElree

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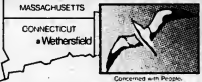

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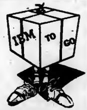

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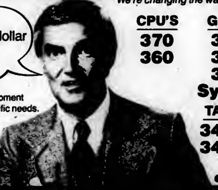

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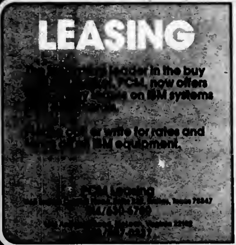

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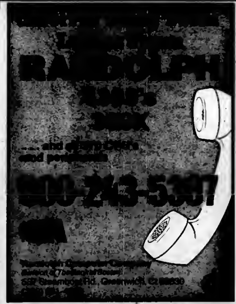

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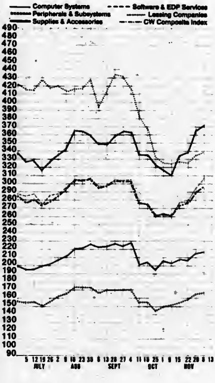

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EXCH		PRICE 1978-79 RANGE (1)	PRICE CLOSE DEC 5 1979	PRICE WEEK NET CHNGE	PRICE WEEK PCT CHNGE
	COMPUTER SYSTEMS				
A	AMDAHL CORP	17- 69	23 1/2	- 3/8	-1.5
N	BURROUGHS CORP	59- 87	80 3/4	+1	+1.2
O	COMPUTER AUTOMATION	9- 44	11 3/4	+1 3/4	+17.5
N	CONTROL DATA CORP	23- 55	55 1/8	+1 5/8	+3.0
O	CRAY RESEARCH INC	8- 47	45 1/4	-1 1/4	-2.6
N	DATA GENERAL CORP	42- 74	57 1/4	+2 1/4	+4.0
N	DATAPOINT CORP	34-104	104	+8 3/4	+9.1
N	DIGITAL EQUIPMENT	39- 68	67 3/8	- 1/4	-0.3
N	ELECTRONIC ASSOC.	2- 13	7	+ 1/8	+1.8
A	ELECTRONIC ENGINEER.	9- 19	15 1/4	- 1/2	-3.1
N	FOUR-PHASE SYSTEMS	19- 46	46 3/8	+ 7/8	+1.9
N	FOXBORO	28- 44	38	- 1/4	-0.6
O	GENERAL AUTOMATION	7- 26	12 3/8	-1 5/8	-11.6
O	GRI COMPUTER CORP	1- 3	1/2	- 1/8	-20.0
N	HEWLETT-PACKARD CO	24- 83	57 1/4	+ 1/4	+0.4
N	HONEYWELL INC	43- 83	80 1/2	+1 3/8	+1.7
N	IBM	62-321	65 3/4	0	0.0
O	MANAGEMENT ASSIST	9- 20	17 7/8	- 1/4	-1.3
O	MANUFACTURING DATA S	9- 35	34 1/2	+2 1/4	+6.0
O	MINI-COMPUTER SYST	2- 8	3	- 3/8	-11.1
O	MODULAR COMPUTER SYS	7- 18	10 7/8	- 1/2	-4.3
N	NCR	37- 81	65 3/4	0	0.0
N	PRIME COMPUTER INC	9- 23	23 1/8	+4 1/4	+22.5
N	PERKIN-ELMER	17- 39	39 3/8	+3 3/8	+9.3
N	SPERRY RAND	33- 52	48 1/8	+ 1/4	+0.5
A	SYSTEMS ENG. LABS	11- 24	18 1/8	+1 5/8	+9.8
O	TANDEM COMPUTERS INC	13- 40	39 1/2	+2 1/4	+6.0
A	WANG LABS.	8- 32	32	+2 1/4	+7.5
	LEASING COMPANIES				
O	BOOTHE FINANCIAL CP	13- 21	17	0	0.0
O	COMDISCO INC	3- 21	11 1/2	+1 1/2	+15.0
A	COMMERCE GROUP CORP	1- 1	1/4	0	0.0
A	COMPUTER INVSTRS GRP	1- 7	2 1/8	- 1/4	-10.5
O	CONTINENTAL INFO SYS	3- 15	2 7/8	+ 1/8	+4.5
N	DATRONIC RENTAL	1- 4	2 1/2	0	0.0
A	DCL INC	3- 6	5 1/8	0	0.0
N	DPF INC	8- 14	9 5/8	+ 5/8	+7.0
N	ITEL	4- 36	5 1/8	- 5/8	-10.8
N	LEASCO CORP	24- 55	54	+1 3/4	+3.3
N	LEASPAC CORP	1- 4	1/4	0	0.0
A	PIONEER TEX CORP	2- 7	2 3/4	0	0.0
N	U.S. LEASING	12- 20	19 1/8	+ 7/8	+4.1
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	1- 2	3/4	- 1/8	-14.2
O	ANACOMP INC	8- 24	17 1/2	+ 3/4	+4.4
A	APPLIED DATA RES.	8- 17	8 5/8	0	0.0
N	AUTOMATIC DATA PROC	24- 40	38 1/4	-2 1/4	-5.8
O	COMPU-SERV NETWORK	5- 17	17 1/4	0	0.0
O	COMPUTER HORIZONS	1- 8	5 1/4	+1 1/2	+40.0
O	COMPUTER NETWORK	5- 16	5 7/8	+ 1/2	+9.3
N	COMPUTER SCIENCES	8- 18	10 3/8	+1 1/2	+8.0
O	COMPUTER TASK GROUP	1- 7	6 3/4	+ 1/4	+3.8
O	COMPUTER USAGE	2- 4	2	+ 1/4	+14.2
O	COMPUT AUTO REP SVC	4- 10	6 3/4	- 1/4	-5.0
O	COMSHARE	8- 26	17 1/2	+ 1/4	+1.4
O	CULLINANE CORP	14- 33	31 1/4	+4 3/4	+17.0
O	DATA DIMENSIONS INC	1- 8	1 3/4	+ 1/4	+16.6
O	DATATAB	1- 4	1 1/4	0	0.0
N	ELECTRONIC DATA SYS.	15- 28	26	+ 1/8	+0.4
O	INSYTE CORP	1- 3	1 1/2	+ 1/4	+20.0
O	IPS COMPUTER MARKET.	2- 3	3	0	0.0
O	KEANE ASSOCIATES	3- 6	5 1/4	0	0.0
O	KEYDATA CORP	1- 4	3 1/2	0	0.0
A	LOGICON	14- 19	16 1/4	+ 3/4	+4.8
O	NATIONAL DATA CORP	7- 17	15 3/4	-1	-5.9
N	PLANNING RESEARCH	4- 10	6	- 1/8	-2.0
O	PROGRAMMING & SYS	1- 1	7/8	+ 1/8	+16.4
O	RAPIDATA INC	3- 7	4 3/8	- 1/8	-2.7
O	REYNOLDS & REYNOLD	18- 36	29	- 1/4	-0.8
O	SCIENTIFIC COMPUTERS	3- 9	4	+ 1/2	+5.0
N	TYMSHARE INC	18- 50	50 1/8	+2	+4.1
A	URS SYSTEMS	5- 8	7 7/8	+ 3/4	+10.5
A	WYLY CORP	1- 7	5 1/2	0	0.0
	PERIPHERALS & SUBSYSTEMS				
N	AM INTERNATIONAL	13- 32	18 3/4	- 1/2	-3.5
N	AMPEX CORP	10- 20	19 1/2	+ 1/2	+2.6
O	ANDERSON JACOBSON	5- 13	12	- 3/4	-5.8
A	APPLIED DIG DATA SYS	8- 27	8	+ 1/8	+1.4
O	BEEHIVE INT'L	3- 7	4 7/8	+ 1/8	+2.6
A	BOLT,BERANEK & NEW	6- 17	17	+2 1/4	+15.2
N	BUNKER-RAMO	14- 28	26 5/8	+1 1/8	+4.4
O	CAMBRIDGE MEMORIES	1- 9	1 3/8	- 1/4	-15.3
N	CENTRONICS DATA COMP	18- 56	51	+1 3/4	+3.5
O	COGNITRONICS	1- 6	2 1/4	+ 1/4	+12.5
O	COMPUTER COMMUN.	6- 10	6 1/4	+1 3/8	+28.2
O	COMPUTER CONSOLES	4- 18	19	+1	+5.8
A	COMPUTER EQUIPMENT	3- 4	4 1/2	- 1/4	-5.2
O	COMPUTER TRANSCEIVER	1- 5	3 3/4	- 1/8	-3.2
O	COMPUTERVISION CORP	5- 49	46 3/8	-3	-6.0
N	CONRAC CORP	13- 26	16 1/8	- 3/8	-2.2
A	DATA ACCESS SYSTEMS	8- 10	8 3/4	+1	+12.9
A	DATA PRODUCTS CORP	13- 25	17 1/4	+ 1/8	+0.7
O	DATUM INC	2- 6	2 3/8	+ 1/4	+11.7
N	DECISION DATA COMPUT	2- 6	2 7/8	0	0.0
O	DELTA DATA SYSTEMS	1- 1	1/2	0	0.0
N	DOCUMATION INC	6- 34	21 3/4	+2 3/8	+12.2
O	DATARAM CORP	6- 32	27 1/4	- 1/4	-0.8
N	ELECTRONIC M & R	3- 4	3 1/2	+ 3/8	+12.0
O	FABRI-TEK	1- 2	3/4	+	+8.0
O	GENERAL COMPUTER SYS	1- 3	1 7/8	+ 1/8	+7.1
O	GENERAL DATACOMM IND	9- 21	10	0	0.0
N	HAZELTINE CORP	10- 21	20 7/8	+ 5/8	+3.0
N	HARRIS CORP	17- 36	31 1/2	-1 1/8	-3.4
O	INFOREX INC	1- 11	1 1/2	0	0.0
O	INFORMATION INTL INC	7- 12	8 1/2	- 1/4	-2.8
O	INFOTON	1- 3	2 3/8	- 1/8	-5.0
O	INTEL CORP	26- 72	71 1/2	+2	+2.8
O	INTERSIL	7- 32	28	- 1/4	-0.8
A	LUNDY ELECTRONICS	4- 9	7	+ 1/4	+3.7
O	MSI DATA CORP	6- 10	7 5/8	- 1/4	-3.1
N	MEMOREX	18- 59	18 5/8	-1 1/2	-7.1
N	MOHAWK DATA SCI	6- 18	15 5/8	+ 3/8	+2.6
O	ONET	2- 8	8 1/2	0	0.0
O	PARADYNE CORP	4- 23	23	+ 1/8	+0.5
A	PENRIL CORP	5- 14	13 1/4	+1 3/8	+11.5
N	PERTEC CORP	8- 17	16 3/4	0	0.0
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	RECOGNITION EQUIP	3- 13	6 5/8	- 3/8	-5.3
O	SCAN DATA	1- 5	1 5/8	+ 1/8	+8.3
N	STORAGE TECHNOLOGY	14- 46	16 7/8	- 1/4	-1.6
O	T BAR INC	11- 25	26	0	0.0
A	TEC INC	6- 11	5 3/4	- 1/8	-2.1
N	TEKTRONIX INC	33- 63	59	-1 3/8	-2.2
N	TELEX	3- 8	3 5/8	+ 1/8	+3.5
O	TESDATA SYSTEMS CP	8- 26	10 1/4	+2 3/4	+36.0
O	WILTEK INC	1- 2	1/4	- 1/8	-33.3
	SUPPLIES & ACCESSORIES				
A	AMERICAN BUS PRODS	6- 12	10 3/4	- 1/4	-2.2
O	BALTIMORE BUS FORMS	1- 4	1	0	0.0
N	BARRY WRIGHT	16- 34	21 3/8	- 3/8	-1.7
O	CYBERMATICS INC	1- 1	3/4	0	0.0
O	DUPLEX PRODUCTS INC	13- 31	26 1/4	- 1/2	-1.8
N	ENNIS BUS. FORMS	5- 21	15 7/8	- 1/8	-0.7
N	3M COMPANY	43- 66	50 1/4	0	0.0
O	MOORE CORP LTD	26- 34	30	+1 1/4	+4.3
N	NASHUA CORP	18- 37	31	+ 3/8	+1.2
O	STANDARD REGISTER	20- 29	25	- 1/2	-1.9
A	TAB PRODUCTS CO	8- 18	14 7/8	+ 1/8	+0.8
A	WABASH MAGNETICS	18- 22	14 1/4	+1 1/4	+9.6
N	WALLACE BUS FORMS	18- 33	27 5/8	+ 1/2	+1.8

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 1 P.M. OR LAST BID
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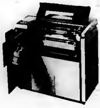
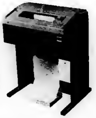


☐ 2550 (1500 lpm Charaband)

☐ CT 1200 series (600, 1000, 1200 lpm ChainTrain)



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☐ PS 10 (special switching equipment allowing one printer to service several computers)

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